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A REPORT ON A WEST COAST WHALING CANOE RECONSTRUCTED AT PORT RENFREW, B.C.

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Reconstructed at Port Renfrew, B.C.
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Abstract

The following report describes the construction of a moderately large West Coast or "Nootka" canoe of red cedar from observations at Port Renfrew, B.C., in 1973-74, supplementing other descriptions of the art of canoe carving and documenting the particular example built for the National Historic Parks and Sites Branch, Parks Canada, for eventual display at Friendly Cove. A brief overview of the Northwest Coast canoe styles places the West Coast canoe in area perspective. Construction description covers materials, tools and technical procedures, both as manifested in the project and as recalled by the builders, Charles Jones, Sr., hereditary chief of the local Pachena tribe, and George Louie, Sr., from Ahousat. Canoe usage is described from recollections and other sources since cedar dugouts have passed out of existence except in the specialized form of the modern racing canoes and the increasingly rare modified fishing boats without the high traditional head pieces at the ends. Lastly, the Port Renfrew whaling canoe reconstruction project is briefly evaluated as an instance of material culture study in ethnology.

Submitted for publication 1974, by E.Y. Arima, British Columbia Provincial Museum, Victoria.

Précis

Le texte suivant relate les observations faites à Port Renfrew (C.-B.), en 1973-74, sur la construction d'un canot taillé dans le cèdre rouge, d'une grandeur moyenne, typique de la côte Ouest et aussi connu sous le nom de "Nootka." Cette description complète la série de textes portant sur la fabrication des canots et servira de documentation au modèle construit pour la Direction des lieux et des parcs historiques nationaux de Parcs Canada dans le but de l'exposer éventuellement à Friendly Cove. L'introduction comporte un bref aperçu des styles de canot de la côte Nord-Ouest et permet de placer le canot de la côte Ouest dans son contexte régional. La description portera sur les matériaux, les outils et les procédés techniques qui ont été utilisés pour la réalisation du projet et qui ont été évoqués par les fabricants, Charles Jones père, chef héréditaire de la tribu locale Pachena, et George Louis père, d'Ahousat. En ce qui concerne l'utilisation du canot, il a fallu s'inspirer d'autres sources et recueillir différents témoignages car les pirogues dans le cèdre sont pratiquement disparus et ne subsistent que sous la forme spécialisée du canot de course moderne ou encore sous la forme, de plus en plus rare, de bateaux de pêche modernes, modifiés et dépourvus des extrémités relevées des canots traditionnels. En bref, le projet de reconstruction du canot de Port Renfrew, destiné à la chasse à la baleine, est un exemple du type d'étude en culturelle matérielle entreprise dans le domaine de l'ethnologie.

Preface

The National Historic Parks and Sites Branch of Parks Canada had a West Coast or "Nootka" whaling canoe reconstructed at Port Renfrew, B.C., in 1973-74 by Chief Charles Jones, Sr., of the Pachena tribe, for future display at the historically significant site of Friendly Cove on Nootka Island. The highly refined red cedar dugouts of the west coast of Vancouver Island have much been admired and repeatedly described, sometimes in considerable detail. For the whaling class of canoe in particular, T.T. Waterman (1920) prepared an outstanding study among the Makah around Cape Flattery. While one can hardly hope to rival that work written over half a century ago when ethnographic information was far better, some details may be added on construction based on participant observation of the recent Pachena canoe. For other associated aspects such as harpooning gear, whale hunting and ritual, less can be added today as cultural memory fades so that the oft-cited earlier ethnographic accounts of Curtis (1916), Drucker (1951), Swan (1870) and Waterman (1920) should be consulted for fullest information. The present study includes some material on use but is mainly about canoe making.

Photographs and drawings other than those credited to individuals or institutions were done by the author.

Acknowledgements

Thanks are owed to many for making the whaling canoe reconstruction possible. First must be mentioned Chief Charles Jones, Sr., the primary canoe builder, carrying the vital traditional knowledge from the past and having the enthusiasm to still undertake the demanding task of making a big canoe in his advanced years. He also extended his welcome and hospitality, together with his family of whom his wife Mrs. Ida Jones was especially kind, always making the writer feel at home and also helping greatly in ethnological enquiry. Ken Jones, their youngest son, supplied invaluable assistance during the construction with his ability to do heavy work such as rolling the canoe log and indeed had actually done the blocking-out of the hull several years earlier. He and his wife Marcina were very hospitable as well and without them the writer would have been much more at a loss at Port Renfrew, not that the community in general was not sympathetic. Marcina's father's brother, George Louis, Sr., was of major help on the construction, not the least for the building of the prosaic but necessary large shed to keep off the elements during the winter. He also helped with his considerable knowledge of traditional matters from Ahousat and was unfailingly cheerful, a quality to be much appreciated on a difficult project. Finally, sincere thanks go to British Columbia Forest Products and Mr. Ken Hallberg for supplying the cedar.

Rendering of Native Terms

To render native terms in the following acount a practical orthography is adopted which represents sounds by English spelling conventions to a large degree with the use of several digraphs, for example, sh, ch, ts, tl, for phonemes which might be otherwise written with single but less commonly recognizable symbols. The system is also geared to the English typewriter keyboard except for the glottal stop sign which is a hook obtained by taking down the question mark's dot with file or emery. Presented previously (Thomas and Arima 1970), the orthography remains a working one and has been modified in the representation of the glottalization of nasals and semivowels, for example, m', n', w', y', so that it is the same as that for the glottalized consonants.

p t k m n w y s h sh ch ts tl - approximately as in English
ɬ - somewhat like the "thl" in athlete
q - back or deep "k," voiceless velar stop
x X - rubbed sounds or fricatives in the front and back "k" positions, as in German ich and ach
H - like "h" but with the tongue back narrowing the throat
ʔ - glottal stop or breath catch, as in uh-uh
! - like ʔ with tongue drawn back narrowing the throat
m' n' w' y' p' k' ts' tl' etc. - glottalized or "cracked" sounds, nasals, semivowels and consonants
i e a 0 o - as in pit, pet, putt, pot, put
i: e: a: 0: o: - as in feed, bad, father, fog, food
i:: a:: - extra long vowels indicating emphasis

Introduction

Northwest Coast Canoe Styles

"Canoes were the cornerstone of Northwest Coast economy" writes Bill Durham, author of perhaps the best comparative survey of these craft to date (1960: 39-82). Vital and highly developed as they were, records are often sketchy, especially for the century of European contact before the later 19th century, and classification into groups at different levels of distinction remains problematical. Perhaps the most important classification is that by natively named categories or types in the culturally significant sense, but, almost needless to say, information remains quite incomplete in this regard. Very helpful are the native distinctions presented in the Culture Element Distributions studies by Barnett (1939: 238-9, 282-4) and Drucker (1949: 181-2, 252-7). Classification into major areally distinguishable groupings by some ethnologists (for example Drucker 1955: 72-6; Olson 1927: 19-22; Waterman 1920: 10-12) are useful for gaining an overall view of Northwest Coast canoe forms, although Durham charges them with oversimplification and loss of much colour in the subject through concentration on the typical at the expense of the rare or eccentric (Durham 1960: 42-3). The latter often furnish clues to developmental interrelationships. The following listing of canoe styles is given with the above considerations in mind in order to place the whaling canoe of the study in areal perspective. Photographic illustrations are included to aid the comprehension of complex forms for which verbal descriptions alone hardly suffice, as Durham notes (1960: 54).

Haida or Northern canoes, also at times called Queen Charlotte Island, Tsimshian, Alaskan, or even Fort Rupert, typically had rounded bottoms, flaring or leaned-out sides, a strong sheer or concave curve in the gunwales rising to either end, sharply narrowed and well-raked or slanted-out ends, and great high stem and stern projections with chopped-off tips. The prow was met below at an angle by the almost vertical leading edge of a cutwater blade reaching up about half the depth of the hull, while the stern rose in a long uninterrupted curve from the bottom (Figs. 1, 2). The Haida built the biggest and best canoes in this style, trading many to the Tsimshian, Tlingit and Kwakiutl who also made their own versions (Drucker 1949: 252; 1955: 73; Durham 1960: 43). The northernmost Tlingit or Yakutat had a variant in their smaller, finely made, 15-ft.- to 18-ft.-long hunting and family canoes with major differences in the ends, the stern having a vertical blade from within a few inches of the tip while the bow cutwater slanted well forward below, purportedly to fend ice and giving the front a large notch in profile (Durham 1960: 46). Another major variant was the large, perhaps 40 ft. to 60 ft. long, war canoe of the northern peoples referred to as the "Head" canoe from the greatly enlarged bow with the cutwater reaching to the very tip at a moderate rake. The stern was also made much deeper into a wide blade with a concave lower edge in profile. On top the ends were straight, making breaks in the centrally curved line of the gunwales, and apparently quite wide, looking like platforms tilted up to the tips (see illustrations of models in Durham 1960: 54, 56).

Coast Salish canoes of the Gulf of Georgia, lower Fraser River and Puget Sound were similar to northern canoes in having a rounded bottom and ends which though not as high, projected well out with the prow meeting a cutwater below while the stern slanted up from the very bottom. The ends

looked chopped-off though not as wide vertically as in Northern canoes, and the stem usually had a distinctive narrow notch in it horizontally. The Vancouver Island variant, or yishelt, was more slender and graceful than the somewhat chunky mainland nokwil with its vertical cutwater and shorter stern projection ending with a blunt overhang (Figs. 3, 4; Barnett 1939: 282, 283, Figs. 568, 570). An earlier variant may be pictured on a 19th-century postcard of Nanaimo showing a canoe with both ends having projections which curve concavely below into well-raking cutwaters (Fig. 5). Drucker considers Coast Salish canoes to be "essentially a small low-sided variant" of the Northern model (1955: 73), but developmental relationships are not yet established in detail.

Nootka, Chinook, Southern or West Coast canoes could be readily distinguished by a near-vertical stern capped by a small elevated platform, and a long rising prow ending in a form like a deer's or dog's head with a snout-like tip surmounted by the widened ends of the gunwales. The concave lower edge of the prow, usually composed of the well-raked cutwater line running into the even more out-slanting head piece, gave a "clipper bow" effect. Earlier the prow may have been lower by the indications of older models and photographs (Durham 1960: 49). The hull had a distinctive cross-section with a flattened, actually slightly V, bottom and well-flared sides concavely lipped out at the top to throw off waves. The gunwales, with little sheer for most of their length, curved smoothly into the rising prow but turned up quite suddenly at the elevated stern (Fig. 6). The major variant was the poorly known war canoe of the late 18th century in which an only moderately raked prow rose high and wide to serve as a shield during attack landings with archers able to shoot through holes in it (Durham 1960: 58-63). The better recorded Kwakiutl war canoe or manka appears to be a variant as well with its high moderately slanted prow and

West Coast-like stern, flattened on top (Durham 1960: 58; Drucker 1951: 84). The gradual curve of the gunwales up to the elevated stern top was recalled by Charles Jones for a large old West Coast type. A variant at the other extreme for size and purpose was the small double-stern canoe with each end made in the near-vertical platform-topped stern configuration which was used by children and women (Durham 1960: 51). The "headless" fishing dugouts of the second quarter of this century might also be considered variants, with or without motors, decking or cabins, although without the characteristic end pieces they no longer look much like West Coast canoes. Another 20th-century variant is the extremely slender race canoe, mainly made and used today by Coast Salish with increasingly rudimentary stem and stern forms.

River canoes were generally round-bottomed and blunt-ended at the waterline. Without the extreme end developments of the coastal craft, they have drawn less attention and may be underdifferentiated in classifications. Olson (1927: 19-22) lumped them into a "shovel-nose" type with broad squarish ends which may be best limited to craft of the rivers entering Puget Sound and the Columbia River. The Yurok-Karok-Hupa canoes of northern California with their distinctive transversely peaked blunt ends were another variant (see Drucker 1955: Pl. 10). On the lower Fraser the shovel-nose (Fig. 7) was recently displaced by small narrow dugouts with sharp vertical ends (Fig. 8). "Spoon" canoes, so named because the gracefully upcurved ends resembled goathorn spoons, had rather pointed tips (Fig. 9). They were used by the Bella Coola, Kwakiutl and some Gulf of Georgia Salish (Durham 1960: 53). Mention may be made of makeshift cedar bark canoes, mainly for lakes and rivers, made by folding a large piece lengthwise, clamping and pitching the ends, and spreading the main body with thwarts (Barnett 1939: 284; Drucker 1949: 254; Durham 1960: 46-7).

"Nootka" or West Coast Canoe Classes

At this point it might be noted that "Nootka" is a misnomer for the people of the West Coast of Vancouver Island. The word is taken from the verb form no:tka:, "to circle about," heard by James Cook in 1778 from some natives of Friendly Cove explaining that the place was an island that boats could go around (Moser 1926: 160; Thomas and Arima 1970: 2). The 20-odd surviving tribes at best apply the name to the island and the mowach'atH confederacy natives of the region. If they designate themselves as an ethnic group distinct from others, they would prefer "West Coast" which reflects native geographical and sociocultural categorization. Hence the present account favour the phrase "West Coast canoe."

Canoes, generally termed chapats, were distinguished into a half-dozen class types with certain characteristic uses and range of dimensions but each retaining the overall configuration of the West Coast model except for the children's canoe with "stern at both ends" and the poorly known war canoe with its special high shield-prow. Different writers have recorded different sets of classes and terms, no doubt reflecting regional variation. Since this report is concerned with a whaling-class canoe reconstructed at Port Renfrew in the tribal style of the Southern West Coast division, the classification given will mainly follow that elicited from Chief Jones and his wife, one extensive enough to encompass other listings. Source of alternative native terms will be indicated by abbreviation as NC for Northern and Central West Coast (Drucker 1951: 83-4; Koppert 1930: 26-33 for Clayoquot tribe; A.T. = Alex Thomas pers. com. for Tsishaat tribe) and S for Southern West Coast, commonly termed Nitinat, including Makah (Waterman 1920: 13-14 for Makah; C.J. = Charles Jones and I.J. = Ida Jones for Pachena and Nitinat tribes). Variation in size made the classes shade into each other and also alternative use of a canoe might shift its designation,

as when a freighter might be used for war, ceremonial occasions or whaling. On the other hand, for each class a certain configuration was more ideal than others so that even if classes overlapped in size, that is, length, they could remain distinct to a degree. It may be helpful to regard West Coast canoes as falling into three general sizes: large or 30 ft. to 60 ft., medium or 18 ft. to 30 ft., and small or 8 ft. to 16 ft., with each having craft designed for general utility in routine work and other more specialized models. For example, the large category would have the freight canoe as a generalized craft and special designs in the whaling, war and giant canoes. The proliferation of native terms given in the following listing arises from alternative names, usually for different uses, of the same model, dialect differences, and inconsistency in recording and rendering by ethnologists. The last has been adapted to the English-like spelling system of this study; for example, the Boasian c and L used by Waterman and Drucker are changed to sh and tl, their u to o, and Waterman's Δ to a.

Freight or moving canoes, shitlats (S, C - A.T.), pinewoł (NC - Waterman; [Koppert (1930: 26) gives penawał; Alex Thomas gave p'in'wał as the term for whaling canoe]) were about 35 ft. to 45 ft. in length or even longer, 4 ft. to 6 ft. wide and 2 ft. deep amidships. They transported household and goods on the seasonal moves within the tribal territory, two canoes often being put together and decked over with house planks for leisurely travel in good weather, the people living aboard the while. They were used, too, singly and under sail, for the longer trading and visiting voyages common after warfare declined in the second half of the 19th century.

War or ceremonial ("inviting") canoes, witaXsts (S - I.J.), witaksats (S - Waterman), tl'i:qsats (S - C.J.), tleʔiks (S - Waterman), chitso:ls (C - Koppert Chee tsools).

tl'itso:l (C - A.T.) meaning "white-faced," originally were quite variant from the typical West Coast form having a high broad shield-prow which projected only half as far forward as usual and was twice as wide (Koppert 1930: 30). Normally about 45 ft. long and carrying about 30 men, they sometimes were up to 60 ft. long. For speed they were built light and proportionally narrower than freight canoes. On the outside were painted symbolic figures (Jewitt 1967: 71) and on the prow might be fitted carved ones. The latter was of the typical deer's or dog's head form in the 19th century, perhaps because wooden shields were made obsolete by guns.

Whaling canoes, o?o:taXsts (S - I.J.), o:?o:tahsats (NC - Waterman), sotaots (C - Koppert), ranged about 30 ft. to 40 ft. long, 4 ft. to 6 ft. wide and 20 in. to 24 in. deep, and were preferably beamy in order to carry much gear as well as a crew of 6, 8, 10 or even 12 men. Whalers apparently were largest in the southern division. According to Drucker (1951: 84), they, unlike freighters, were never decorated with painted designs or rows of opercula, those oval shell doors of sea snails, but Jewitt (1967: 71) said that whalers in particular sometimes had a double row of opercula inside below the gunwale. They were treated with special care, kept glassy smooth on the bottom, never dragged but carried on shore, and sometimes even kept inside.

Three-people canoes, qaqtsi:steq (S - I.J.), atlakwodiyak (M - Waterman) were about 22 ft. long and rather narrow (Durham 1960: 50). Used for fishing and general transport, these and other middle to small canoes are not too sharply distinguishable.

Sealing canoes, yasha:baXsts (S - I.J.), yashbaqats (M - Waterman), yashmaqats (NC - Drucker), were specialized middle-size craft, 22 ft. long by 4 ft. wide used during the commercial fur sealing of the late 19th century when they carried two men and up to 22 seals. The bottom was finished

very smooth and had the keel-like end blades pronounced to avoid slapping in chop.

Sea otter canoes, kwakwaklasats (C - Koppert), according to Koppert (1930: 32) were 16 ft. long and proportioned like the sealer. Two men manned each (Drucker 1951: 46-8).

Fishing canoes, achaqinahais, chapana (NC - Drucker), chi:tssats (C - A.T., Koppert), were the general purpose small craft 14 ft. to 16 ft. long by 3½ ft. wide, narrow on the bottom to keep the same speed through all conditions for trolling. Altered into the broader modernized dugout with plain low ends and a small inboard or outboard motor, they have lasted to the mid-20th century.

One-man canoes, ts'awi:steg (S - I.J.), tak'oediyak (M - Waterman) were only 10 ft. to 12 ft. long, allowing only one to sit in it and at that in the middle.

Children's canoes, hopidowash (M - Waterman), were even shorter but beamy for stability and served as educational toys for children and work vessels for women gathering food or fishing along the shore. For the Makah they are recorded with both ends having the stern shape (Waterman 1920: 14), but others have the usual bow (for example, B.C. Provincial Museum specimens).

The Reconstruction Project at Port Renfrew

The undertaking of the reconstruction of a whaling canoe at Port Renfrew was first attempted in 1967 for the National Museum of Canada of which the writer was then a staff member. The museum had a great Haida canoe built at Massett in the late 19th century but lacked an example of a large "southern style" Northwest Coast canoe to complement the northern model. Since Chief Charles Jones of the Pachenas at Port Renfrew had during the course of previous visits indicated detailed knowledge of and strong interest in canoe making, it was

decided to ask him to make a big whaling-class craft. His youngest son, Ken, was interested as well and with his logging experience provided considerable assistance, particularly in the heavier work such as chain sawing and turning the log. The manager of the Port Renfrew Division of the British Columbia Forest Products Company, Ken Hallberg, was most co-operative and helped arrange the donation of a large red cedar log, 37 ft. long by almost 5 ft. wide at the butt end. The reconstruction proceeded from mid-August to early December, but was never completed.

A second log, 38 ft. long and 5 ft. thick at the butt, was in the dryland sorting yard of the British Columbia Forest Products Company along with the other which had been chosen for its clearer wood. The following year, Ken Jones, disappointed that the 1967 canoe had been dropped after all the work of shaping and hollowing the hull, undertook reconstruction of a whaling canoe with the second log for the National Historic Parks and Sites Branch, Parks Canada, which sought the craft for display in a future development of Friendly Cove on Nootka Island. He began by drawing scale outlines and by carving a solid model of the hull minus the head pieces at the ends, 40 in. long by 3-5/8 in. wide by 1-5/8 in. deep amidships, a sleek form tapering to the bow and fuller in the after half. The log was rotten at the centre, particularly at the butt end, so a couple of feet were bucked off there to see if the rot lessened and another couple of feet after that, bringing the length down to 35 ft. With the addition of the head pieces, especially the long bow piece, a final canoe length overall of about 38 ft. was expected. About a third of the thickness was next removed to give an initial top surface. The top outline was then cut with the chain saw to be tear-drop shaped, narrower end to be the bow at the top end of the log. The bottom of the hull

was roughly defined as well. With the hull thus blocked out, the second reconstruction lapsed inactive until 1973.

In the summer of that year, the writer chanced to visit Port Renfrew and found the blocked-out log weathered but still workable according to the chief who recalled past instances of abandoned canoes being resurrected years later. He was willing to try again, although he would not be able to do the heavier work, while the National Historic Parks and Sites Branch for its part proved still interested in having its whaling canoe made. Construction was resumed in October, beginning with clearing the site of several years of bushy growth and considerable metal scrap since the area had been a bit of a junkyard. Tools were organized, the log was rolled bottom-side up with the aid of a Gilchrist jack, and the chopping off of the "corners" at the ends began at the end of the month. It had become the wrong time of the year to begin canoe making for the heavy winter rains were about to start, but the opportune combination of personnel and support, which did not seem likely to recur, meant that the reconstruction had to proceed in spite of the unseasonal conditions if ever it was to be carried through. In December, with the rain falling in earnest, George Louis of Ahousat, Ken Jones's father-in-law, arrived to assist on the reconstruction and as a first step helped erect a large shed to keep off the rain.

In January the shed was completed so that actual canoe construction could be resumed, but the chief fell seriously ill with influenza and afterward remained indoors through the cold weather except to occasionally inspect the work. The hull shaping and hollowing proceeded through the winter, but not as efficiently as it would have had the chief been constantly present. In March he came to work regularly as the weather improved. Construction progressed better so that by May the head pieces were going on the ends and the

canoe was in its essential shape. Then George Louis left the reserve and the project to build a sealing-class canoe at a world crafts exhibition, leaving the still considerable work of finishing the craft to the chief and the writer. Having roughly outlined the course of events for the whaling canoe reconstruction at Port Renfrew, the account will now continue in a more technical manner.

Materials and Equipment

Tools

As highly developed as West Coast woodworking was both in quantity and quality, the tool inventory was rather limited consisting of "Maul, chisels, wedges, D-adze, straight [elbow] adze, simple drills, grindstones of sandstone for finishing, sharkskin for fine polishing" (Drucker 1951: 77). Jewitt, exaggerating the simplicity somewhat, noted at the beginning of the 19th century that the canoes were "...hollowed out from a tree with their chisels solely" (1967: 70). Blades were of iron by then instead of the former stone, mussel shell or antler, but the chisel was driven with a round stone. There was also an unhafted pestle-like hammer, handy for driving wedges and pegs, which old men typically pecked into shape over months at night when the stone was believed softer (Swan 1870: 35). The straight chisel was apparently the main tool for roughing out canoes and even felling trees in preference to the axe in Jewitt's time (Swan 1870: 35; Koppert 1930: 8, 23). Finer shaping was done with the adzes whose blades were commonly of trade axes cut into two narrow pieces by filing (Swan 1870: 34). The steel axe soon became the primary tool for tree felling and removing the bulk of the wood from the canoe log in the 19th century (Swan 1870: 36). Also important for roughing out the canoe, especially in the hollowing, were the wedges, both the steel logging ones and the traditional wooden wedges of yew of rectangular cross-section. The latter ranged in size from 2-ft.- to 4-ft.-long ones for splitting great lengths of wood, as in plank making, to little

stubby ones several inches long suited for blocking out short chunks in hollowing the canoe hull (Drucker 1951: 78; Koppert 1930: 9).

By this century almost all of the traditional tools had been replaced by western manufactured counterparts and additional tools like the saw and plane. In the mid-20th century the power chain saw became a regular canoe making tool and most recently the electric power plane is being used for surface smoothing, but at the same time cedar canoe making has virtually ceased except for race canoe manufacture and the rare museum reconstruction. These modern tools have simply speeded up the shaping of the canoe in the main rather than altered the work which remains fundamentally unchanged in procedure; that is, the top is levelled, the hull is shaped outside, the inside is hollowed, the hull is brought to its final shape, the end head pieces are blocked out, added to the hull and shaped integrally with it, thwarts, seats and duckboards are added. The drill may be cited as an example of the nature of the replacement of traditional tool by western forms. It is used to make holes for gauging the thickness of the hull during its shaping and for holding pieces together by pegging and lashing. Originally the drill had a bit of dense bone set in a wooden shaft. Deer or bear leg bone sharpened to an abrupt square or narrow notched point is recorded by Drucker (1951: 79) for the bit. Eagle bone was recalled by Charles Jones (indicated by initials hereafter) for the drill bit which was about 3/4 in. in diameter (S.D. MacDonald [pers. com.] says the humerus is that thick). This traditional drill, which was twisted briskly between the palms, continued to be used into the second half of the 19th century with the bone bit replaced by iron or steel wire flattened and sharpened at the point (Swan 1870: 34). It was superseded by the western brace and bit which can exert much more twisting force through leverage. Also acquired,

although of only secondary use in canoe making where holes are not fine, was the manufactured twist drill turned by geared wheel. Most recently the portable electric drill has come into general home carpentry use and in the more substantial models can be used to make holes for canoe making, at least the shorter ones running through the hull sides as for the thwart lashings in the Port Renfrew whaling canoe reconstruction. The brace and bit remains the primary boring tool in canoe building, however, since scarf-pegging holes and thickness-gauging holes at the outset are deep. The manufactured drills save much labour over the old stick and bone bit drill, but on the other hand, modern man finds less time to devote to craft.

Chief Charles Jones, Sr., over the years has acquired a large collection of tools, in considerable part from old logging operations in the locality, including items such as jacks, blocks, and blacksmithing equipment as well as more regular logging and carpentry tools like axes, wedges, sledges, handsaws, crosscut saws, chisels, slicks, hammers, planes, braces and bits (including extra long ones), spokeshaves, vises and clamps. Some of the tools may be given brief comment for being a little out of the ordinary and being especially adapted to canoe making. First may be noted the several large steel adzes of Chief Jones (Fig. 10) which have different degrees of transverse curvature to the blade from flat (left on Fig. 10), through flat with lipped edges and slightly curved with lips, to moderately and deeply cupped (right on Fig. 10). These adze heads also have a longitudinal curvature so that the upper part of the front surface will stay clear of the work surface when the adze is swung through its cutting stroke arc (Figs. 11, 12). In profile view may be seen the heavy squarish tops to the heads which serve not so much as hammers but as weight for increased cutting force as is required with the broad blades. Hafted mostly on long

pick and mattock handles (many large adze heads are very close to mattock heads), the large adzes can strike with great force and for much of the work are to be swung with restraint rather than full vigour. The two well-cupped adzes were particularly suited for digging out the narrow ends of the hull interior, but for the open areas of the main body they bit too deeply. The flat-edged adze for its part was of little use even on large flat areas because it tended to become imbedded in the surface or to break the wood away at its sides when cutting shallowly. The remaining two lipped adzes with none or slight central edge curvature were the best for levelling open area. The smaller of the two, which was easy to use because of its lighter weight, the narrower cutting edge not requiring as much inertial force behind it, is a cooper's adze for making barrel staves (Fig. 12 centre). For taking down the surface to the amount of an inch or two rather than just dressing it level as in the shaping outside of the complexly curved hull end, the well-cupped adzes were useful for cutting across the grain with the necessarily up and down swing motion because only a narrow central part of the blade would be cutting with the heavy weight of the large head helping to drive it through the grain. If the technical considerations described are not immediately clear, they should become more readily comprehensible when met again later in the context of the hull shaping process.

The D-adze, so-called because its handle is shaped like the letter, is the canoe making tool par excellence, being used for long hours when bringing the craft to its final shape. The mark of the accomplished canoe builder was his ability to swing backhand with the chahaik as easily as he could in toward himself. The best could also use the other hand, a great asset in accommodating to the different cutting directions imposed by the grain and orientation of the work.

In a sense, the essence of canoe making is to chip away the wood a little at a time with the D-adze, never taking off too much at a spot at once and keeping the shape under control as a whole. Charles Jones had three excellent heavy D-adzes for canoe carving with blades of tool-steel cut and ground to his order, 1/2 in. thick, 7½ in. to 8½ in. long, 1 in. to 1¼ in. wide at the rear and 2¼ in. to 3 in. wide near the front before rounding into the curved edge which was sharpened in a gentle curve up on the underside from about 3 in. back. The handles of yellow cedar root were about 7½ in. to 8 in. long with the grip a little over an inch thick while the slot was about 3½ in. long for a large hand with work-thickened fingers. From the front of the slot where the edge of the hand would be to the blade tip was about 3 in. to 3-3/4 in. In overall size, the three adzes were 8½ in. to 9½ in. long by 3½ in. high. The blades were fastened with two or three countersunk screws. Precise dimensions are not as important as the configuration which may be seen in the photographic illustration (Fig. 13). To be noted are the hollows in the top of the handles at the back for the thumb, and the forward top humps which can stop the heel of the hand. Not visible is a refinement whereby the blade is sometimes set at a slight tilt transversely to facilitate chipping with the "offhand" swing, kiko:ɬ, out to the side and away: for a right-handed adze the blade would then be tilted to be higher on the left side as it is viewed end-on from the front.

Curved knives were used to a very limited degree in cutting the groove along the bottom of the interior of the bow head piece which divides near the top around a raised triangularly pointed tongue extending back from the harpoon groove. Most of the whittling of pegs and peg-locking wedges was done with a pocket knife, cutting in toward oneself in native fashion. The curved knife blades were

from old knives or files and were hafted in short wooden handles for single-handed cutting, being made for carving masks for the tourist trade.

After the surface was levelled with the adzes, curved drawknives were extensively used to smooth it in the whaling canoe reconstruction. A variety of curvatures were used (Fig. 14). The more fully curved ones were helpful in shaping concave sections such as the transition from the bottom to the sides inside the hull where the surface curvature was in addition gauged by the drawknife which served as a template as well as the cutting tool (Fig. 14, upper left). The more flatly curved drawknives served to smooth open areas, being mostly drawn across the grain at a slanting angle. Cutting with the grain, it is harder to keep the surface even as the knife tends to cut deeper in certain spots than in others as the grain goes in or out. A structural feature to watch in making curved drawknives is that the height of the handles above the cutting edge be not so great as to cause "chattering" or skipping of the blade on the wood without cutting.

After the drawknife work, plane and spokeshave were used to smooth the surface. The spokeshave on a swivel mount with a long handle was far handier than that with fixed short lateral grips. The main plane for the reconstruction was an older model with a wooden bottom (Fig. 15). A canoe builder at Nitinat in the past had rounded up the toe of such a plane in order to be able to smooth concave surfaces.

Modifications to axes should be mentioned as they are adapted to canoe carving. First, the ordinary double-headed axe should be the very long-bladed heavy felling axe for ample cutting force and for reach downward in chopping out the inside of the hull. The corners of the blade must be well-rounded so that they will not catch in the wood. Single-head axes were used as well, but only in modified form for the Port Renfrew reconstruction. One simple but very

helpful alteration was to curve the handle (Fig. 16), allowing chopping of the interior farther to the narrowing ends through placement of the handle at a greater slant relative to the canoe while maintaining a sufficiently cross-grain cutting angle at the blade. With a straight handle, the butt will soon not clear the near side as one works toward the ends. In another modification, the head of a wide single-blade axe was reversed to have a forward protrusion and the blade was bent sideways (Figs. 17, 18). Such an axe was for chopping in the ends, the blade protrusion permitting cutting into a narrow notch and its curvature facilitating cutting the concave sides nearing the bottom. Also, the tip might be bent over in a little lip to cut the chips free at the end. The reversed and bent axes were not much used in the Port Renfrew canoe because its ends were made thicker than usual and the interior was not brought to a narrow notch at the ends but left bluntly rounded.

Last but not not least among the more special tools for canoe building possessed by Charles Jones might be mentioned a large grindstone turned by hand and running in water. Red cedar, as soft as it feels, dulls cutting edges quite quickly and sharp tools are essential for efficient and good work. Like most accomplished craftsmen, Charles Jones kept his tools as sharp as possible, spending much time filing and whetting edges. In the press of working to a deadline, the wheel grindstone was actually not much used as no one got to turn it, but considerable whetting was done with a piece from a broken stone. The stones were relics from the days of felling with axes by the loggers. On the whaling canoe reconstruction, cutting tools suffered much from dust which had become packed hard into even the finest cracks as the canoe log lay for several years beside an unpaved road with heavy traffic with the hull blocked out so that there was no protective layer of wood of any thickness left along the upper part of the sides, let alone the bark.

Wood

Red cedar, Hobi:s (S), Homi:s (NC), was particularly suited for canoe making, being large, straight, comparatively clear, resistant to decay, light and easily worked but strong. Canoe logs were obtained as drift logs, by tree felling or by splitting off part of a standing tree. Most of the largest canoes, according to Durham (1960: 66), were made from drift logs, a huge trunk as much as ten feet thick being obviously difficult to fell and move. Also, Drucker (1951: 79) notes that cedar with clear knotless trunks grow back in the woods where a tree would foul in others clustered around in being felled. Trees at the water's edge or in clearings might be felled easily but carry branches low on the trunk making them unsuitable, he continues, so that the usual procedure was to split off a large slab from a tree by making two deep cuts the desired canoe length apart, the top one wide to drive wedges downward to begin the split into which a good-sized pole was inserted crossways. With wind action the pole worked down until the split reached the lower cut in time and the large slab fell out (Drucker 1951: 80). Charles Jones, although he had seen a fallen cedar with a canoe section removed in the vicinity of Sarita on the east side of Barkley Sound, did not believe that canoe wood was obtained by splitting it off a standing tree because people could not climb so high (Drucker recorded use of a tie-rung ladder), even the lower cut having to be made perhaps nine or ten feet up from a scaffolding to clear the root buttresses of a large cedar. Koppert (1930: 8-9), for the canoe making centre of Clayoquot, gives the impression that it was usual to fell cedar for canoes. It may be that there was acculturative change with the acquisition of metal tools in the manner of obtaining canoe cedar.

The tools for cutting trees changed over time, of course. Most descriptions do not mention fire, but Charles Jones said

it was used aboriginally in conjunction with shell- or stone-bladed chisels and with wet clay being applied around the cut to control the burning. (Curtis, apparently writing generally for the Northwest Coast but with data mainly from the southern sectors, says "The tree was felled partly with fire, but more by means of a chisel and a short, spool-shaped stone driver, or maul" [1913: 59].) A pair of specialists might take three months to fell a large cedar. The tree might be tested first with a hole to see whether it was hollow in the centre and also punky enough inside so that it might ignite completely. Trunks were also struck up high with a mallet to test by sound for hollowness which was no drawback in itself for West Coast canoe building since the end head pieces reached well down on the hull. A solid trunk was more necessary for the Northern canoes whose head pieces did not extend down much (Durham 1960: 68), consequently, test holes were chiselled deep into trees (Boas 1909: 344; Carter 1968: 48, 53, Pl.). In West Coast felling with chisels, which were about 18 in. long by Koppert's Clayoquot information (1930: 8), a pair of cuts were made all around the trunk a foot or more apart and the wood in between was progressively split out (Curtis 1913: 59; Olson 1936: 66). The lower cut was taken straight in horizontally while the upper one slanted down to it, one part being cut deeper and flat to direct the fall. Longer chisels were used when needed. According to Charles Jones, the idea was to cut all around through the sapwood first as it causes splitting in the fall. Magical direction of the fall to a favourable spot by throwing chips there and telling the tree to go down gently is recorded for the Kwakiutl (Boas 1909: 344) and similar practices no doubt were current throughout the area. Cedar growing at the water's edge could be felled to the water, of course, and must have been

utilized despite Drucker's statement that branches low on the trunk made them unsuitable for boards and canoes (1951: 79) since knotty wood with its weaving grain, although harder to work, was also appreciated for resistance to splitting in canoes (C.J.). Clearer trees back in the woods would be chosen with an eye to having an all downhill route to water, whether the sea or navigable river. The hull was roughly shaped and hollowed on the spot, then skidded down to the water, with safety lines to control descent, to be towed to the village for completion. Sometimes the builder waited for snow to slide out the canoe, a couple feet of snow eliminating the need for skid logs (C.J.).

There are other kinds of wood besides red cedar, of course. Curtis (1913: 59) has given large yellow cedar as the canoe wood, but must have made a slip since it tends to split when carved into large vessels. The farthest north Yakutat Tlinglit, however, made their small canoes from yellow cedar (Durham 1960: 66) and if it were obtained as driftwood, perhaps the sojourn in the sea seasoned it to resist cracking. On the Port Renfrew whaling canoe project, yellow cedar, bachtla:tapt (S), was used only for pegging, a not unimportant role. It was paddle material too, along with maple, ebitsqapt (S), and yew, łatapt (S), but since yellow cedar and maple tend to get brittle when cold and crack, for the outside unsheltered waters paddles were ideally only of yew (cf. Koppert 1930: 33; Swan 1870: 38) as reflected in the term for paddle, łata:wach (S). Yellow cedar was recalled by Charles Jones as having been used for some small canoes in his southern West Coast region and as being very light, lighter than even red cedar, possibly partly because it was carved thinner. But tried by a man for a larger canoe, it checked badly. Another considered spruce, to:hopt (S), for a racer

with a thinner hull. Canoe builders experimented.

Fir, sabaXtqapt (S), and hemlock, qwiɬqapt (S), were the usual materials for the crosspieces of the canoe, according to Charles Jones. Fir was preferred for its greater rigidity. One could always tell a crosspiece was hemlock if it bent when stepped on. Crosspiece poles were collected preferably when the sap was running, in May-June, for easy peeling of the bark. When collected at other seasons, they could be planed down to the wood, but then looked different. Straight poles were sought, of course, with little taper in thickness which was selected to be proportional to the size of the canoe, about 2 in. thick for a 30-ft. to 40-ft. canoe. A thickness gauge was prepared by splitting a stick and placing it around a suitable-sized sapling, then holding the jaws at the distance by a crosspiece. Other saplings of the same size could then be easily selected. An excess number of poles were gathered to allow for some spoilage during construction. Yew was formerly used for the forward pair of crosspieces on which the harpooner stood to strike the whale, but was given up for an unrecalled reason. Perhaps yew was too rigid and could contribute to the splitting of the hull when the canoe was pounded by waves.

The bailer was carved from alder, q'aqapt (S), or cedar, alder being prefered because it did not crack readily. Painted with a wood preservative, it lasted many years.

Supplementary Materials

Cedar branch rope, sopsiʔia:t (S), was used to lash crosspieces to the hull and to tie together scarf joints. Red cedar was commonly used, but yellow cedar was also good with longer branches. A pitchier kind of the latter was distinguished as

ch'oqłapt (S), black leaved and making the hands sticky. The branches were to be gathered when the sap was running for easy peeling of the bark and suppleness for twisting without breaking. Young saplings about 15 ft. to 20 ft. tall and 2 in. to 3 in. thick were sought on steep slopes where the branches grow long, free of kinks and of relatively uniform thickness without side branchlets or closely spaced leaves. When suitable branches were found, about ½ in. thick and 5 ft. to 6 ft. long, each was twisted in turn by stripping the leaves except for those at the tip which was grasped in the left hand, palm up, and winding the other end with the right hand. As the twists began at the weaker tip end, they were not allowed to gather too closely and form a a kink. As a few twists developed, the section was taken up in the left hand, being wrapped around the back and across the palm so that the twists would occur in the next part. The process was continuous and quite rapid. When the branch was twisted all along its length and wrapped around the left hand, it was uncoiled and the bark, loosened during the twisting, usually slid off easily. Then the branch was re-coiled until use, storage being possible for months. For immediate use, the coiled branches were kept in water, and after long storage, they were soaked overnight. Made correctly, cedar branch rope had a smooth hard surface and was far better than commercial hemp or sisal rope, much stronger, not stretching or shrinking, and rot resistant. Some split the dark "timber bind" off the thicker butt section, leaving only the clear for better twisting. Koppert mentions repeated alternate twisting and heating for strength (1930: 36).

Charcoal to mark parts for fitting together is a humble material with its place in canoe making. Usually it was prepared from red cedar but devil's club was considered to give the finest charcoal.

Pitch was used for caulking although parts were fitted so closely together that it wasn't needed for many joints (cf. Koppert 1930: 28; Swan 1870: 37). Pitch lumps on trees, ishits'i:p (S), were gathered and chewed, gum chewing being a favourite pastime. Or a large pitchy spruce or balsam growing on a river bank might be cut in the base and set on fire there so that the heat would melt the pitch which was caught as it dripped in large clam shells or, more recently, tin cans. For use it was cleaned of bits of bark, needles and other debris and cooked until the right consistency was attained as tested by dripping a little into cold water when it should solidify immediately. Also used for caulking was shredded cedar inner bark (Drucker 1951: 88). Although not used in his region, Charles Jones said that it was elsewhere with the outer brown and inner light-coloured layers being matched to the canoe wood, pounded over an edge until fine like wool, jammed into the crack and pitched over.

A wood-preserving dope was made from hemlock or alder bark, crushed and steeped in seawater, cedar swamp water or, best for penetration, aged urine. Hemlock with dark pitch was the best and collected at the pitchy parts. Hemlock bark gave a dark red colour and alder a browner hue to the interior where the dope was applied, the exterior being scorched black. The interior could also be painted with red ochre of which the brightest was obtained by trade from the Quilleute south of the Makah (Koppert 1930: 26; Olson 1936: 70; Swan 1870: 17, 37). The ochre was mixed with dogfish oil, seal oil or mashed salmon eggs (Drucker 1951: 83). White or blue clay might also be used to paint parts decoratively.

Dogfish oil was preferred for canoes by Charles Jones as being fine. It was formerly produced in quantity by the Pachena tribe for trade, both to the Makah in exchange for the edible whale oil (Swan 1870: 29) and, in the second half

of the 19th century, to the whites apparently as a lubricant for the sawmill industry (Drucker 1951: 12) as well as other purposes. The livers were cooked in pots with hot stones or by simmering near a fire to extract the oil which was skimmed off (Swan 1870: 29). Also in the fall the flesh was slightly smoked, steamed on hot stones, and squeezed in little cedar bark baskets to extract a milky liquid which was then boiled and cooled to separate the oil (Swan 1870: 29). Washed in fresh water and squeezed into balls, the flesh became edible fish cakes. Since dogfish livers were not readily obtainable in the two to three dozens quantity required for the whaling canoe reconstruction, boiled linseed oil was used instead.

Another dogfish product used in canoe making was the skin for finishing the surface smooth. As the equivalent of sandpaper, which was actually used instead in the Port Renfrew reconstruction, dogfish skin might have been better mentioned under the section on tools. Several grades of abrasiveness were distinguished. Small dogfish gave a finer grade skin, as may be expected, and the belly skin was the finest, the back less so. Large dogfish were rougher and roughest were the fins. Pieces of skin were cut off and placed on the bottom of an upside down openwork burden basket, flesh side to the basket so that the skin would adhere and remain stretched. Near the fire it would dry in just half a day. Fins dried slower, being left whole so that the stiff cartilage inside would serve as a sanding block. Sharkskin was usable for a long time, for two or three months, and improved with age, becoming softer and finer through use (C.J.).

Construction of the Whaling Canoe

Blocking out the Log

When the cedar for the canoe was obtained by felling, windfall or as drift log, it was peeled of its thick bark and cut to the desired hull length minus the end projection of the separate bow piece. Formerly fire may have been used at times to help cut the log. In the case of the whaling canoe reconstruction at Port Renfrew, the log had been cut to about 40 ft. by the local logging operation, with chain saw, of course, and transported to the reserve by truck. It was set on old railway ties arranged as a pair of skids a dozen feet apart and crosswise to the log. With the bark off, the exposed wood could be examined for faults such as knots, ingrown seams, rotten parts and cracks to decide what sector would be best for getting a sound hull with the maximum possible beam. The bottom being decided upon, the excess wood of the top half was taken off, formerly by splitting from the upper end (Olson 1936: 66). Koppert describes the old method as follows, the log evidently lying on its side:

> Splitting of the log, (tla chitl). A wooden wedge about four feet long and three inches in diameter is driven in the end of the log as far as possible....Two smaller wooden wedges are then driven into the crack, one above the other. Other wedges are driven in as the larger is forced forward. Finally when these wedges are in as far as possible, a wedge about three and one-half feet long and four inches in diameter is pounded down the crack from the top; a second, a third, and a fourth such wedge is used until the big tree is split (Koppert 1930: 9).

The half that was to be the canoe was turned to rest level on the flat split face and the corners of the bottom were taken off to start pointing the ends. Axes, formerly chisels, and wedges were used, the wood being split off quite quickly to taper the ends. Canoe logs could be manhandled by two or three men using levers and blocks. A few builders who preferred to work entirely alone would weight the lever down to hold up the log for blocking (Drucker 1951: 82). For the Port Renfrew reconstruction, levers were used when the hull was hollowed and fairly light, but before then a Gilchrist mechanical logging jack was employed.

Since the initial part of the reconstruction was not observed, the present section is based on reported information and previous experience with a reconstruction in 1967. In 1968, Charles Jones's youngest son Ken began by making a solid cedar scale model of the hull minus the end head pieces to a scale of 1 in. equalling 1 ft., incorporating design features such as end cutwaters, very slightly V bottom, and greatest beam aft of amidships learned from the unfinished 1967 craft. The very well-crafted model was made 40 in. long by almost 4 in. wide since the log was about 40 ft. long, the maximum length cut for trucking except for special orders, and about 5 ft. thick at the butt end, the largest-size cedar ordinarily logged at present although bigger trees may occur sometimes, for a mid-length diameter of about 4 ft. Since the log was rotted in the centre at the butt, Ken bucked off about 2 ft. with a chain saw to see if the rot decreased farther in. It continued so another section was cut off to give the canoe log a length of 36 ft. 2 in. The centre remained unsound for about a diameter of 14 in. at the butt end while at the other end the centre rot was about 9 in. across. After the bottom part of the log was decided upon, the top third was taken off with chain saw and wedges. Making the thicker butt end the stern, Ken outlined the hull in top view on the flattened surface with the chain saw, leaving

the stern 20 in. wide and the bow end 16 in. wide on top. The sides were cut in at a slight slant since they would be flared. Beam amidships was almost 49 in. with the sapwood taken off. Flattening of the bottom was begun with rip cuts by the chain saw, making the roughly blocked hull 34 in. deep at the stern and 33 in. deep at the bow. The log was then left lying on its side untouched until reactivation of the project in the fall of 1973.

Quite different from the foregoing manner of blocking out the hull was the procedure of Charles Jones starting the previous incomplete whaling canoe of 1967. That hull began as a similar-sized log, 37 ft. long by 5 ft. wide at the butt end and 3½ ft. wide at the small end as it was positioned with the side selected to be the bottom on top. Instead of taking off the wood of the upper half first, the chief began by flattening the bottom, making cross cuts with the chain saw at 1-ft. to 2-ft. intervals to about a 7-in. depth to wedge off the wood. At each end, 4 ft. of the log was left untouched for the keel-like cutwaters. Since the grain had a spiralling twist over the length of the log, the bottom was not levelled transversely and the flattened surface had a warp in it, leading Ken Jones to run the old big McCulloch saw with a 5-ft. blade down the length of it. His brother Chuck, who had experience in building smaller modern dugouts, commented that a hump should have been left in the middle of the length for rocker, or longitudinal convex curvature to the bottom, since there now wouldn't be enough wood left to have the gunwales at the middle of the thickness of the log for the greatest possible beam. At the outset the chief planned to make the butt end the bow, but then changed the ends around as he was interested in having a deep stern. From this experience, Ken made the butt end the stern on the second reconstruction attempt. Although the usual practice appears to have been to make the butt end the bow, the reverse use of the log was evidently an established alternative. For

the Clayoquot, for example, Koppert writes: "The corners of the log are then chipped with a view to bow formation at the end, and stern formation at the broad end" (1930: 23). For the Quinault, who though linguistically distinct had West Coast style canoes, Olson gives a rather subtle reason for making the butt the bow, as follows:

> The butt end of the log was always used for the bow of the canoe for the reason that the wood of that portion has a higher specific gravity. When only one man is in the canoe it manages much more easily if the bow is relatively heavy. The canoe swings less easily with each stroke of the paddle than if the bow is light and rises out of the water (Olson 1936: 69).

Neither Charles Jones nor canoe builder George Louis of Ahousat recognized the foregoing rationale for preferring to make the butt the bow, their reason being simply that the greater diameter at the butt end provided more wood for the greater depth and width of the bow end of the hull proper with allowance for the addition of the long rising prow piece.

The ends of the 1967 hull were roughly pointed with the chain saw by making angled cuts which both tapered the ends in top profile (with the bottom up) and slanting out below for flare. The awkwardness involved in trying to angle the chain saw in two planes at once at the desired depth fostered an accident which was fortunately minor in that Ken Jones did not lose any toes in the foot-cut he suffered. The incident forcefully demonstrated one major drawback of the power saw in canoe carving. Since the blocking-out cuts for the 1967 hull were directed by Charles Jones, it is instructive to compare the result with the blocking-out of the second reconstruction done in 1968 by Ken working more independently. From diagrammatic scale drawings (Figs. 19, 20) it may be immediately noticed that the second blocking-out was much more thorough and went directly to the overall hull form, with allowance of spare wood, particularly at the

ends, while the first hull was chain sawed much more tentatively with so much spare being left at the quarters that the log retained its essential cylindrical form. Even the top half of the log had been left on, contrary to usual procedure, as much from caution as from convenience in elevating the bottom for the initial part of the hull shaping. The cut to arrive at the flat bottom surface was direct enough, but its deepness, at 7½ in. to 8 in. from the original surface, was such in part because the bottom turned out to be warped when the wood was wedged off and Ken levelled it with the chain saw. The salient characteristic of the chief's manner of canoe carving was to take the wood down bit by bit, or "chip by chip" in George Louis's phrasing of the explicitly expressed principle. Such cautious control entailed loss of speed, as Charles Jones recognized, saying that canoe carving was slow work. His son Ken, in keeping with his youth, could not be so patient and thus took off a great deal of wood at once with the chain saw o n the second hull. But without sufficient experience, too much wood was removed in places, for example, none left higher towards the ends for the cutwater-skegs so that later the bottom would have to be taken down farther to bring out the blades, and the narrowing of the bow without leaving it wide enough to receive a large head piece. Durham makes a statement of relevance to the present discussion as follows:

> A master craftsman, hewing to the line in his mind's eye, could form a hull with little more adze work than that required to delineate the form. Only an unskilled man needed to hew and rehew each surface many times, cautiously approaching the desired lines (Durham 1960: 70).

Durham does not mention or distinguish the rapid blocking-out part of the hull shaping, but it is implied that the master builder could go more directly to the final shape by blocking out more closely to it. To block out the hull near its final form without thorough mastery

of canoe carving would be unwise, of course, and proceeding by the slower approximative method would be safer for although all may not be lost if too much wood might be taken off, compensation or patching for the error is laborious. By the rough state of the work after blocking out and the relative rapidity of this initial part of the hull shaping, it might be thought that blocking out is of comparatively minor importance as a part of the canoe making process. On the contrary, it is a most vital step, particularly when working at the limits of the material as is the case with large canoes, since it determines in large part whether or not maximum use is made of the log. Also, if the builder has sufficient mastery to block out close to the final hull form without committing errors, great savings in labour are made.

Through verbal description alone it is likely difficult to fully appreciate the technical distinctions being made. The understanding of material culture phenomena is best communicated by actual participation, in making, using and even ideating in the realm, yet such participation is only rarely possible and reliance must be placed on verbal communication. In case some future attempt to make a large canoe based in part on the present description occurs, it might be suggested that in blocking out the hull the procedure of Charles Jones be followed with the modification that the upper half of the log be first split, blocked or ripped off, and that the ends be tapered in top outline but leaving ample spare width and not attempting to slant in below for flare to the sides. About half the length amidships might be left straight in top outline, uncut, and the bottom cut might be made to only 5-in. to 6-in. depth at the root of the untouched sipo:s sections.

Shaping the Hull Exterior

Work recommenced on the second whaling canoe reconstruction in the fall of 1973. First, a heavy growth of salmonberry

and other bushes which had sprung up about the canoe log since 1967, almost hiding it from view, had to be cleared away along with considerable scrap metal, for the site had been somewhat of a junkyard. On the bow end grew a luxuriant patch of moss. Since the major transverse crack in the bow had split wider over the years, the end was cut back a foot reducing the log's length to 35 ft. 1 in. Since the log lay on the starboard or right side of the hull set upright for ripping the bottom with the chain saw during blocking out, it was turned bottom-side up with a Gilchrist jack. The "corners" at the ends were taken off with axe and wedges, and then the bottom surface was levelled with axe and the chain saw used like a plane. A centreline was marked along the bottom with string and lumber crayon for marking in turn the edges of the bottom to be equidistant from the centre. With the bottom outlined, a chain saw was used to trim off the excess at the edges, but in the process was allowed to cut in too deeply on the starboard at amidships and from about 4 ft. to 8 ft. back from the bow, the latter upsetting the chief since the already narrow bow section had become so meagre in beam that it would in all likelihood have to be cut back to keep the front end from being too slender when the head was fitted on. An earlier slip with the chain saw in 1968 while the bottom was being bucked at intervals for wedging off the wood, at 20 ft. 3 in. from the bow end of the hull, made a cut half a foot deeper than the bottom surface. For its labour-saving speed, the chain saw is a boon to canoe builders, but it must be used with sufficient foresight in planning cuts and with care to avoid overcutting. Incidentally, used in 1973-74 were a heavy saw with a 36-in. blade or bar and a lighter machine with a 20-in. bar. While a heavy saw is an asset in canoe building, it is possible to make all the cuts for even a whaling canoe with a smaller one, albeit less quickly, particularly when ripping deeply.

In a sense the blocking-out of the hull was completed only after the bottom was levelled with the corners taken off by axe and wedge, and the next stage of the finer shaping began with the more careful second outlining of the bottom (Fig. 21). To outline the edges, Charles Jones used a flexible lath, or "limber stick" as he called it, curved into place with hand and retaining nails for one side of the bottom. The curvature of the line was determined by eye or "eyeballing" as the process of sighting from the end and the middle might be termed quite appropriately. The aim was to arrive at a smooth flowing curve giving the maximum width possible to the bottom amidships in keeping with the maximum beam possible on the top side, taper towards the ends sufficient to cut easily through the water and at the same time a certain fullness through the quarter-sections to give good hull volume, both for total load-carrying capacity and for buoyant ends. The maximum width to the bottom, at this outlining, was made to be 35 in. at a position a yard behind the middle of the length, the overall shape being a tear-drop one with the fuller end to the rear. With axe and D-adze the edges of the bottom were taken off to the drawn outline, not vertically downward on the outside but with the edge rounded off to about 8 in. below the bottom surface, again leaving intact more rather than less wood along the turn of the bilge where the bottom meets the sides.
A month had elapsed since the canoe work, discounting preparatory tasks, was started afresh in late October and the winter rains had begun to fall in earnest so that a roof was needed if work was to continue through the rainy season. In the specific history of the construction of the Port Renfrew canoe, the erection of a large shed 48 ft. long with an interior width of 18 ft. for ample log-turning space may be mentioned as consuming a good month of project time. George Louis, Sr., an uncle-in-law of Ken Jones from Ahousat,

arrived in December to help build the canoe and did the major part of the shed construction.

In January the hull shaping was renewed with George Louie slowly smoothing the bottom and the sides with axe and D-adze. The ends were tapered further to 3-in.-thick tips, forming the blade-like cutwaters (Fig. 22). These sipo:s did not, however, protrude above the bottom as they should for a keel-like effect since the whole length of the bottom had been taken down during the blocking-out with chain saw. Thus the main bottom surface had to be taken down again, about 2 in. being removed amidships and 3 in. at the beginnings of the sipo:s which were made 8 ft. long at the bow and 6 ft. long at the stern including 2 ft. of excess spare length each (Figs. 23, 24). Rocker or longitudinal curvature was slight at an inch height over 21 ft. of length. Also transversely the mid-line was brought out to be about an inch higher than the outer edges for a slight V-effect while the edges themselves were rounded off again (Fig. 25). The sipo:s were trimmed down to fair smoothly into the main bottom surface (Fig. 26) and the hull surface as a whole was smoothed with a small electric plane (Fig. 27). The sides of the end blades had been concavely flared out toward the eventual gunwales and the resulting hollows were run smoothly into the slightly convex main section of the sides. All of this hull shaping proceeded principally on the basis of eyeballing by George Louis who had had experience in building modern cedar canoes and had come to learn the construction of the high traditional ends. In older phrasing Swan writes of the canoe builder, "He is guided in modelling by the eye, seldom if ever using a measure of any kind; and some are so expert in this that they make lines as true as the most skilful mechanic can" (1870: 36).

Marking the log was practiced more extensively by Charles Jones than in the impression of past canoe building

provided by the literature, using pencil, indelible pencil, lumber crayon of different colours, string, tape measure, 3-ft. rule, and longer straight and curved edges of light lumber. Of the latter edges, particularly useful were two lengths of lathe about 1¼ in. wide by 3/8 in. thick, 6 ft. and 10 ft. long which could be bent to mark the longitudinal curves of the hull. For smaller curves as occur at the ends where the head pieces are given a scooped flare on the sides, a 2-ft. steel rule guided marking. Indelible pencil was favoured for drawing lines because they showed clearly when dampened by the inherent moisture of the wood or wetting and did not rub or wash off. Lumber crayon or chalk of the softest grade was handy for quickly and boldly marking high and low spots, "lumps" and don't-touch areas during the levelling of surfaces. In the time of Charles Jones's father, lines were marked with the corner of the D-adze and sticks were used as flexible strips for forming curves. Also to be noted is the use of plumbs and levels, Charles Jones using current manufactured forms. Vertical could be readily enough determined in the past with less specialized plumb weights on string, a large nail being common in historic times for the weight. Horizontal level, it was recalled, could be determined by special squarish wooden bowls filled with water, but whether such a levelling device was ancient or a recent invention, a case of "stimulus" from the west, is hard to say without wider enquiry.

Through January Charles Jones did not work on the canoe, staying in due to the bad weather, cold, and a serious bout of flu, but in February some good clear days brought him out. Noting a little assymetry in the hull, he made it show up better by marking the bottom surface with longitudinal lines at 1 in., 6 in. and 12 in. out to each side from the centreline, a simple enough but effective procedure. These lines, except for the pair an inch away from the centreline,

had to be marked with level and plumb because of the transverse curvature of the bottom (Fig. 27). Then, to make the curvature uniform at the turn of the bilge, Charles Jones first rounded off a strip amidships with his D-adze to the desired curvature. Splitting out an inch-thick cedar board 2 ft. long and ½ ft. wide, he prepared a template, or pattern as he called it, adzing out a concave curve in the board to fit closely to the newly prepared base curvature amidships, the template curve beginning at one corner of the board and ending in its effective length about 16 in. away from the deepest part 3-3/4 in. down and 10 in. away. That corner of the template was set about 11 in. down on the side. The sides were marked with longitudinal lines 11 in. and 22 in. below the centreline of the bottom with the aid of a level set on a length of light lumber and a plumb line. Every 2 ft. from 8 ft. back of the bow to the 28-ft. mark, the hull was adzed down to match the template. The matching was made precise by coating the template curve surface with graphite lumber crayon dipped in water and rubbing it on the strip of hull being adzed to mark the high spots for chipping off, this process being repeated until the whole length of the curve on the hull became blackened when the template was rubbed on it (Figs. 28, 29). Then the intervening sections between the matched strips were taken down to be level with the latter. Toward the bow the template had been applied for two strips more than was desirable, at this stage of the hull shaping at least, narrowing the bottom too soon at the front so that the centreline could no longer be shifted to compensate for an overly deep cut on the starboard side made with the chain saw during the blocking-out work of 1968. An alternative would have been to prepare another template for the 8-ft. to 10-ft. section with a smaller curve to leave more wood on at the turn of the bilge there. The template technique for setting transverse curvature had been learned by Charles Jones from his father who had

used a springy stick of cedar or hemlock tied at the middle to another stick and bent and fixed at the desired curve by crosspieces tied to the ends (Fig. 27 bottom).

The sipo:s cutwater-skeg blades were judged to stick up too much by the chief. The bottom had been taken down as much as it had been in part through an attempt to reduce the transverse chain saw cut near the 20-ft. point to a depth that would not reach the future interior of the hull. The sipo:s were adzed down an inch at the bow and half an inch at the stern. Faired in smoothly to the hull, their rise above the rest of the bottom became subtle to the eye, particularly at the stern where the projection was actually slight for easier turning, good manoeuverability being needed in a whaling canoe (Fig. 31). Assisting at this stage of the work was a son-in-law of Charles Jones, John Livingston, who, though of New England parentage, had learned mask and pole carving from the Kwakiutl artists Henry and Tony Hunt. Interested in canoe making technique, like so many other carvers in Victoria, he had troubled to travel to Port Renfrew for a couple of days of less remunerative toil. John brought with him an elbow adze, the main Kwakiutl carving tool, which was regarded at first with question as to its suitability for canoe work, but by his skilful and energetic use of the well-sharpened foreign device he soon had the chief praising him as "The man who is good with his tools" (Fig. 30).

Another shortcoming in the hull shaping at this point was irremediable because it was one of having removed too much wood, the sipo:s blades having been thinned down too early. The chief would have preferred to have had them left 6 in. thick instead of 3 in. in order to leave open the possibility of shifting the centreline for best use of the log, particularly for skirting the overcutting of the starboard bow quarter during the blocking-out work. A shift had already been made once in the centreline for

the second outlining of the bottom, shown in Figure 21, when the bow centre was moved ½ in. to port and the stern 1¼ in. to starboard. Retaining the option of moving the centreline was important for the approximative canoe carving technique of Charles Jones and the loss of it during his absence from work through January occasioned a quarrel between the two canoe builders and subsequent avoidance which halted the project for two weeks.

Hollowing the Interior

The canoe log was rolled right side up with the Gilchrist jack raising it in four lifts with the log blocked up each time. First shifted to one side of the shed, the log turned over within about 8 ft. of distance laterally, showing that the shed could have been made only half as wide as it was although the ample width provided good working space. The sides were marked to be 23 in. high from the bottom and the excess wood on top was blocked off (Fig. 32) in the middle section. Then the sheer, or top curvature, was marked with the 10-ft. flexible strip to be 21 in. high amidships, 28 in. high 4 ft. from the bow end and 25 in. high 4 ft. from the stern. The top was levelled down to within a couple inches of the sheer line, the ends being left untouched. The stern looked very wide. The hull was levelled by means of a plumb line at the bow end which had previously had the vertical marked on it when the log was upside down.

Hollowing the inside was begun with a smaller chain saw with a 20-in. bar. A pair of lengthwise rip cuts were made leaving the sides about 10 in. thick for sufficient spare wood and stopping well short of the ends. They were bridged by transverse cuts at about every foot, and the taking out of the interior wood began with the "juggling" out of blocks with wedges driven down the cross cuts to

break them free. Chain saw cuts were, of course, kept shallow in order to avoid going into the eventual hull walls or even through completely. At the stern, the centre rot appeared very great when it emerged on the port as the end was narrowed, so Ken Jones chain sawed 9 in. off the stern but the rot did not lessen appreciably. The wedging and prying out of the wood was often delayed by the occurrence of knots toward the heart of the cedar. In the central section, Ken Jones ripped the sides again with the power saw at an angle to leave just 6 in. gunwale thickness. At the 18-ft. and 22-ft. points, two strips were taken down far enough that a thickness-gauging hole was bored through, revealing bottom thickness to be 5¼ in. With wedges and axework the blocking out of the inside was continued until the bottom was about 5 in. to 6 in. thick. The ends were left solid for about 6 ft. (Figs. 33, 34). In former times, fire could be used in conjunction with adzing as in Olson's account for the Quinault:

> After the log had been split fires were built at intervals or continuously along the split surface. These were carefully watched so that they did not harm the outer margins -- the parts which formed the gunwales and sides of the canoe. Fires were of little service near the bow and stern where the canoe was narrow, as the danger of burning the shell was great. After the fire had burned for a time it was put out and the charred wood removed with an adze. A second method of removing the wood from the inside of the canoe was to cut notches across the inside width of the canoe at half-fathom intervals. These were cut several inches deep, the wood split out, then a new series cut. As the bottom was approached the notches were cut closer and closer together and more care used in the splitting (Olson 1936: 69)

The hollowing at intervals technique may have replaced the charring and chipping procedure with the advent of metal tools in quantity. For the Clayoquot, a slightly different hollowing by intervals procedure is described:

> Once the exact outward symmetry of the canoe is realized, certain grooves are cut in the top flat section to indicate the parts to be hollowed out.

> One groove is cut as near diametrically as possible across the center of the surface running an inch and a half from either side, allowing for the eventual wall thickness. A foot distant from this groove, in each side, two other grooves are cut and then joined by grooves running parallel to the side lines. The wood within this marked area is then hollowed out to the proper depth. The number of such hollowed out places depends on the length of the canoe. With the completion of whatever number is desired, the remaining work of complete hollowing out becomes easy (Koppert 1930: 24).

The chain saw in effect replaces the laborious notching at intervals, whether shallow or deep. With the interior roughly blocked out, it can be used to cut within an inch perhaps of the eventual bottom thickness by gauging the amount of blade projection downward from the top against a piece of lumber set across the gunwales. For the sides, their thickness can be marked, allowing for spare wood, and the saw cuts can be made up to the line, crosscut. The labour-saving speed of the chain saw is, of course, a danger at the same time. In the Port Renfrew reconstruction, the side was cut too thin at the stern port corner of the initial hollowing so that later when the stern was narrowed on top, it had to be bulged there or the interior would have come outside. The outside line had been taken in as the stern was overly broad on top, but not sufficiently.

The ends were hollowed out with the large cupped adze, the wood coming out easily at the rotten centre (Fig. 35). At the bow, the top had been cut down in a curve as for the reception of the prow piece, but the centre rot and bad crack on the port precluded simple addition of the head. Since the ends would be narrowed down much further from the exterior, the sides were left very thick, and also the inside was not hollowed deep right to the ends, which, of course, would be closed. The bottom was thinned and levelled with the large lipped adze which had a slight curve to the blade transversely.

The completely flat-edged adze would dig in too much, especially where the grain turned down into the bottom In thickness, the bottom was to be left at about 4 in. at this point, but parts were taken down to 3 in. in the attempt to level the surface, including the spot aft of amidships where the cut across the bottom was so that it emerged on the inside near the starboard side. The sides were axed down inside to about 3 in. thickness and their top sheer was smoothed (Fig. 36). The rough hollowing had taken approximately two weeks work by two men when the weather turned stormy for a good week, suspending construction until mid-March.

Patching

The chief wanted to fix the big crack in the bow port (Figs. 35, 36) before continuing with further shaping of the hull, outside or inside, but before that task attention was given to the need to "block" the ends, to fill in the centre rotted part with a separate block of cedar at each end placed between the sound lower part of the original log and the head piece to be added on top. For the stern block, a piece was prepared about 18 in. by 12 in. by 8 in. and a square notch was cut out of the stern 10 in. in from the end and down within 11 in. of the bottom. Fitting was begun by sawing between the block and the hull faces held tightly against each other. Cedar charcoal was powdered and mixed with water to form a paste to be used like mechanic's bluing in fitting the pieces together flush. The hull face would be coated with the paste, not excessively, the block would be placed on the hull, hammered a couple of times with the sledge, and the high spots thus marked on the block scarf face would be adzed off. The procedure was repeated until the whole joint surface would be marked, indicating contact throughout. Then the charcoal was cleaned off with sawdust and a V-shaped groove about ½ in.

deep and wide was cut into the lower face of the joint for holding the plastic wood which was used as a seal in place of the former pitch. Three hidden pegs were to hold the joint, and three holes 3/4 in. in diameter were bored 4 in. deep in the lower face on the hull. Temporary loose pegs were put in the holes, their tops not quite flush with the surface, and painted with charcoal paste to mark the block which was placed on top and hammered. Holes were then bored in the block to the same depth. The real pegs were prepared out of dry cedar, the dryness being important to avoid shrinkage and loose fit, split and whittled round with a pocket knife. An end on each was slit with a hacksaw about 1½ in. deep and across the grain to take a little yellow cedar wedge no wider than the peg, as long as the depth of the slit, and about 3/16 in. thick at the butt end tapering to a thin fore edge. With this wedge inserted partly in the end slit so that a half-inch protruded and well-coated with plastic wood, substituting for the traditional pitch, each peg was pushed into its hole in the hull with care, tapping gently with a hammer to avoid setting the wedge prematurely until resistance indicated that the bottom of the hole was reached, whereupon the peg was pounded home, driving the wedge into its end to expand and lock it in place. With the depths of the holes in the block gauged with a stick, the upper halves of the pegs were cut to length, slit in the top ends, and set with the expansion wedges. With the pegs coated and the groove on the hull surface filled with plastic wood, the block was fitted on over the pegs, not without some difficulty because one of the pegs leaned out of the vertical, and tapped down carefully with the sledge until the wedges reached the ends of the holes allowing the block to be hammered hard to lock the pegs. In this instance, however, the block rocked slightly when struck after being pounded into place, perhaps because it was not aligned precisely enough with the hull face

or one of the pegs may have been too long, actual practice falling short of theory. The addition of the block was considered a form of "patching," the fixing of all defects in the hull due to cracks, knotholes and rot in the wood by filling in with fitted pieces, filler substances and covering materials like tin.

With the stern block in place, the concave scarf face to receive the stern head piece was prepared. The head had been blocked out from a 2½-ft.-diameter log to be 27 in. long by 15 in. high at the back by 27 in. wide at the fore ends of the arms slanting out on the sides and 11 in. wide at the back of the top flat platform area. After the scarf faces on hull and head were roughly matched, the head was held in place while first the chain saw and then the handsaw were run through between the pieces. The height of the stern, which started at about 3 ft. with the head roughly fitted, became 32 in., a little on the low side. Before fixing the head in place, however, the rear edge from the block down was chain sawed for rake, the cut slanting in 2 in. over the 16-in. distance, and the sides were sawed in the stern section to take off the "big lumps" there, whereupon the port quarter ahead of the block proved to be rotten. This bad section was sawn out in a downcurving cut from 39 in. before the stern to the bottom of the front face of the block. A correspondingly long and curved patch piece was fitted into place with the charcoal paste technique and held by 3/4-in.-thick pegs put in simply from the top surface through the patch and into the hull. The peg ends were, of course, expanded with the little yellow cedar wedges, the lower ends first and the upper ends after the tops were sawn flush to the surface. In power sawing this surface to the curved scarf face to receive the head piece, an error was made in that the cut was begun at the front edge of the patch piece, 39 in. ahead of the stern, so that the 27-in.-long head piece was unusuable (Fig. 37).

Then, in accordance with the lack of adherence to a rigid sequence of technical steps, the hull in general received further shaping, the inside being dressed down again with the axe along the sides. The gunwales were smoothed again to take "lumps" out of the top sheer line. The side outline was also revised on the starboard with the long flexible strip for marking, ½ in. width being lost amidships in the process, for a beam of only 46 in. The outside excess to the new line was adzed and planed off at a slant rather than vertically downward to leave wood below in case slight correction back to the outside might be wanted later. Fabricating a thickness-marking gauge out of a small piece of cedar which had a lipped edge guide and a notch for the pencil the required distance away, the chief marked the sides to be 2 in. thick and they were thinned down to the line inside, but thickened below to 3 in. at the turn of the bilge. The bottom was levelled inside and the ends were hollowed out further, particularly the stern.

Attention turned to the bow in the last week in March. It had been cut back 18 in. previously in an attempt to counteract the narrowness of the section on top and to eliminate part of the centre rot and the bad crack which slanted down from starboard to port. A block was needed to fill in the remaining centre rot as at the stern, and a slot for it was cut out of the bow 16 in. long and 11 in. deep at the back within the curving scarf face cut on top of the sides, leaving 10 in. of solid wood below. Before the block was fitted, however, the long crack had to be filled. It was eliminated by cutting out with the chain saw which left a tapering slot 7 ft. 1 in. long by 4-3/4 in. deep at the front and ½ in. deep at the rear end. A correspondingly long patch piece was prepared out of cedar split from large slabs conserved from the blocking out of the canoe log, and fitted in with the charcoal paste marking

technique, working from the side (Fig. 38). During the fitting, the slot was spread ¼ in. with a spacer so that the hull would close tightly around the patch piece afterward. For this work, the canoe was tilted onto the starboard and across the top just after the scarf surfaces was nailed a board to hold the sides steady. When fitted into place, the crack patch was held by three pegs inserted from above and below via notches cut into the hull surface. Later, when the side was chain sawed for levelling the surface, the forward two pegs emerged, as did one of patch-fastening pegs at the stern (Figs. 37, 39). For the bow block, a substantial chunk of cedar about 1½ ft. long by 1½ ft. wide by 1 ft. deep was split and sawn out of one of the sections of the canoe log's butt end which had been bucked off in 1968 in the attempt to arrive at sounder wood. After it was trimmed to follow the hull shape below, except for an overhang in front allowing for rake in the bow, and fitted flush with the charcoal "blue," the block was fastened first by a horizontal pair of pegs to each side of the hull. Since the pegs were at an angle to each other due to the sides pointing inward, fitting the block on over them was a problem until a bystander, Ada Jack, daughter of one of the last well-practiced canoe builders, George Gibbs, suggested pointing their ends. The advice was accepted with gratitude for women were recognized to often have insight in technological matters from their meticulous attention to details. Three pegs were then set vertically from the top surface of the block into the sound log below, their ends expanded for locking.

The port side was smoothed by chain sawing, especially toward the ends to point them, adzing to take down lumps, and planing. Along the top, the concave flare was adzed in an inch below the gunwale, leaving some spare for safety. Charles Jones said only a little cut in was needed, about ¼ in. deep, for combined with a lipped-out paddle rub strip

to be added later on the gunwale, it would look well-flared. The bottom and port were charred with a blowtorch in place of the former torch of long splints (Fig. 40). With coarse sandpaper in place of the old sharkskin, the side and bottom were sanded, across the grain to avoid leaving the harder dark layers standing out. The canoe was turned to bring the starboard to the top, with a lever now that the hull was light, and the other side was smoothed and burned like the port. The burning not only smoothed the surface, it made the lumps easier to see by cutting down the glare caused by light and checked sun cracking, the plastic roof of the shed allowing the rays to filter through it and under its edges in the early morning and late afternoon. The second half of April was occupied by the smoothing of the inside to follow the exterior hull curvature, a laborious task with adzes, drawknives and planes (Figs. 41-43). Also, the shaping of the ends of the hull outside was continued, making them gradually sharper. Giant iron rod calipers specially devised by the chief for canoe building were used to check the thickness of the wood which had become about 3 in. on the bottom, 2-3/4 in. at the turn of the bilge and 2 in. on the sides.

Thickness was also checked via ½-in.-diameter holes bored 4 ft. apart along the middle of the bottom and at the turn of the bilge to the sides when the hull was hollowed out to about 4 in. to 5 in. thick. Charles Jones liked to use a piece of heavy wire bent over at the tip to hook against the outside surface to gauge the thickness, but a thin tape measure used in the same way provided direct readings. Precaution had to be taken that the tape end-hook rested on a level with the hull exterior since the holes tended to have their edges broken away when they were made from the interior. For this reason, a stick pushed through until it rested against a small block of wood held against the hole on the

outside was most used for trustworthy readings of hull thickness. As the hollowing continued, the holes tended to become plugged with sawdust and small bits, some requiring reboring with brace and bit. Formerly, as mentioned before, a bird-bone drill was used, Charles Jones specifying eagle bone with three points on the tip. Sproat (1868: 87) writes: "The gimlet, made of bird's bone, and having a wooden handle, is not used like ours: the shaft is placed between the workman's open hands brought close together, and moved briskly backwards and forwards as on hearing good news." For Clayoquot, Koppert mentions the diameter of the holes as being about ¼ in. and the hull as having a uniform thickness about 1½ in. which seems too thin unless the gunwale thickness alone was estimated (1930: 24). Traditionally, thickness was measured by finger widths, and for the Quinault, Olson gives two fingers for the sides and three for the bottom (1936: 69), that is, about 2 in. and 3 in. respectively with thick-boned work-developed hands, as in the Port Renfrew reconstruction. For the Kwakiutl, Boas gives one finger top, one and a half midway on side and two for bottom thickness (1909: 363). On the West Coast holes were bored to the desired thickness with marked drill from the exterior and filled with fire-blackened or naturally dark plugs which showed on the inside when the right thickness was reached (Drucker 1951: 82). If the wood was dark, light plugs would be used (C.J., G.L.). When the holes were left open to gauge thickness progressively, as in the canoes of Charles Jones or among the Kwakiutl (Boas 1909: 360), the bottom ones could serve the prosaic but necessary purpose of letting any rainwater out that may collect inside if a roof was lacking. Not only is it difficult to hollow a rain-filled hull, the solution formed with the strong cedar juice can be painful if splashed in the eye. The holes would, of course, be plugged later as on the Kwakiutl hull shown in Figure 44 from Quatsino at the north end of the West Coast.

In addition to measuring the thickness by means of holes bored in the hull, it could be estimated by feel between the hands. Passing the hands over the work from outside and inside gives a rather approximate estimate of absolute thickness, but a more sensitive one of relative amount of wood so that in combination with the gauging holes made at intervals the technique helps a great deal in arriving at the proper uniform thickness for a sector. Another way of estimating thickness was by the sound made by the striking of the axe or adze. If the supporting blocks or skids under the hull, however, were placed too near the ends, the proper resonance would not be produced and misjudgment of the thickness through sound could occur as happened to Charles Jones once when he went through the end of a canoe while assisting his uncle-in-law with the axe. The latter was quiet for a while, then smiled and said that he sometimes did the same.

Head Pieces and Spreading

The stern head piece, or qwab (S), qwam'a (C), was made from a cedar log chunk 42 in. long and 29 in. wide, clear and solid. Width was a necessity because the scarf face on the hull for the joint, tabedokw (S), was cut forward of the stern for over a yard by error, as mentioned before, to a point where the sides were far apart. In blocking out the stern head, its fore end was set at the middle of the log face to obtain maximum width for the arms of it and made 5 in. deep for a start. From the upper mark drawn for the fore end, a chain saw cut was made back to a 6-in.-deep vertical cut made 17 in. forward of the rear edge, leaving a platform area with much spare wood (Fig. 45). Angled slices were taken off the back corners to narrow the head to the rear, and a large V was taken out of the fore end up to the platform or elevated cap section to separate

the arms and further lighten the piece. A plywood template had been used to match the sides of the scarf face on the hull, cut in a fairly deep curve so that the head would rest well in the hull for resistance to being pushed apart, and this pattern was used to mark the bottom of the head to the same curve to be cut for the initial fitting. Placed on the hull, the head could be marked for the rake at the rear (Fig. 45). The rake was cut in so as to leave a lip at the top 2 in. thick and protruding an inch. The top of the stern head was cut to slant down slightly to the front. Its sides were shaped with axe and adze to be scooped out under the elevated platform which was left 2 in. thick and the arms to the front were trimmed down in depth and thickness. Closer fit at the scarf joint was obtained by placing the head on the hull so that the latter projected a little to the side to permit an inch-thick piece of wood to be run along it as a spacer to hold a pencil to mark the same curve on the head piece an inch higher to be above the uneven and mismatched parts. Cutting to this line produced a fairly snug fit which was made flush by several repetitions of the native "blueing" procedure, that is, coating the hull face with charcoal paint, placing on the head and pounding it for marking, and chipping off the indicated high spots with the D-adze, finishing with the slick or large chisel and spokeshave (Figs. 46, 47).

Fastening was by five hidden pegs arranged as a 3/4-in.-thick "kingpin" in the middle of the back section and in each side a pair of ½-in.-thick pins spaced well apart. Holes were first bored in the hull 4 in. deep to set temporary pegs which were cut to within 1/8 in. of the surface for marking the head hole positions with charcoal. Since commercial dowelling was used, the pegs wedged in tightly and to be extracted had to have nails driven into their ends at a slant to give a hold. When the peg holes were bored in

the head, again 4 in. deep, the peg lengths were estimated by combining the depths of each pair of holes taken with a stick and dowels were cut to be 1/8 in. shorter to be on the safe side after the experience of the stern block which floated slightly after pegging. With ends expanded by the usual yellow cedar wedges set in slits, the kingpin was first anchored in the head piece while the side pegs were set in the hull. Since the latter slanted outward a little, being accommodated to the flare of the sides, some forcing was needed to get them into their places in the head. When the head was gently tapped down and then hammered hard to set the wedges in the peg ends to lock them, it sat solidly enough but the joint was open a crack to the rear since the fitting had been done with the head projecting ¼ in. over the hull at the back while the fastening was with the pieces flush there. The lapse was considered of minor consequence, aside from the show of imperfect workmanship, for the crack was above the waterline and could be caulked as well. The top of the head was 33 in. high which seemed about right since the bow was planned to be 3½ ft. high for the relatively low-prowed whaler. Its rear edge had more rake than the block and hull wood section below so the latter had to be cut to a greater slant, losing an inch at the very bottom. There the sharp heel was rounded off for about 2 in. to the front and up the back, a small amount in proportion to the overall size of the canoe. On top the edges of the flat platform or cap were trimmed down with the small chain saw to give a trapezoid area 15 in. long by 15 in. wide at the front edge by 10 in. wide at the rear, the taper of the sides to the rear being sighted to follow the lines of the gunwales. The arms of the head were reduced again to blend into the lines of the hull, and their fore ends were anchored with exposed 3/4-in.-thick pegs.

Spreading had been ruled out for the canoe because the centre rot and bow crack gave too high a risk of splitting

the hull if the sides were pressed outward. Even with sounder wood, spreading was practiced on only a few of the bigger canoes because the sides were too thick, according to Charles Jones. Canoe builders were scared of a big canoe because its thick sides, needed for strength, were more resistant to bending and could foster splitting if spreading was attempted. Nevertheless, it was decided to spread the hull an inch, cold -- without the use of hot water reported repeatedly for Northwest Coast canoe building -- because the canoe with a beam of only 46 in. amidships was definitely on the narrow side for its length. Cedar spreaders were prepared, 3 in. square in section and with slanted faces on the ends to follow the slant of the hull sides. They were placed at a quarter of the length in from bow and stern, and amidships, then pounded downward to push out the sides by degrees up to 47 in. Hairline cracks which had existed along a line of weakness in the bottom widened perceptibly from the minimal spreading. More seriously, at the bow the port went out ½ in., separating from the block there and breaking the upper horizontal peg between the two. It was brought back in line with the aid of a large iron C-clamp, but a 1/8-in. gap remained between the vertical faces of the two parts. A ½-in.-diameter hole was bored vertically down the gap for a dowel which was driven in to keep the port in and seal the space in an apparently established patching technique for the type of gap.

Spreading was supposed to be done before the heads were on. Although it was not likely to happen, if a once-completed craft were to be spread, its heads would first have been removed. When substantial spreading was planned, the sides had to be left high amidships to allow for their lowering when pushed outward (Curtis 1913: 60). In the round-bottomed northern style canoe which could be spread wider, apparently because the transverse curvature went right around

the hull, the sides were "crowned" up so high and curved in again above the maximally wide mid-line of the log that in top view the interior space had a pinched-in waist or figure 8-like look (Fig. 49; Drucker 1949: 256, item 442). More of the circumference of the log was used and the hull in a sense was "unrolled" from a tubular form. Although the West Coast canoe was not built as a tube to be unrolled, it is interesting that Charles Jones was taught that the hull cross-section should be like a kelp stem near the bulb when it is cut open lengthwise and spread so that his canoes were more rounded at the turn of the bilge than most West Coast craft with a gradual transition from bottom to side. Rounding at and below the waterline was recognized to be conducive to speed, while a sharp turn from side to bottom was known to increase water resistance, but in the chief's canoes the rounding continued well up the sides and they were not much leaned out either since the bottoms were made as wide as possible for large load capacity with shallow draft. With several inches of spreading, the sides would have attained the more usual degree of flare. For such a small amount of spreading, it was probably sufficient to leave the sides straight on top for height so that they would develop a slight sheer after. An early quite specific description of spreading is given for the Makah, as follows:

> If the tree is not sufficiently thick to give the required width, they spring the top of the sides apart, in the middle of the canoes, by steaming the wood. The inside is filled with water which is heated by means of redhot stones, and a slow fire is made on the outside by rows of bark laid on the ground, a short distance off, but near enough to warm the cedar without burning it. This renders the wood very flexible in a short time, so that the sides can be opened from six to twelve inches (Swan 1870: 36).

Swan's mention of the amount of spreading done is valuable information. Koppert, for Clayoquot, says the outside heat was provided by hot stones placed around and sprinkled with

water for steam, and also that the hull was filled "almost full of water" (1930: 27). Partial filling is more likely (Boas 1909: 364; Drucker 1951: 83; Durham 1960: 70; Olson 1936: 69). Olson (1936: 69) deviates from most descriptions in giving the impression that the head pieces were put on before the spreading. Charles Jones added certain details worth mention although they were not recreated for the whaling canoe reconstruction. According to him, the hull was set up on blocks, some water put in and fires made outside along the sides with scrap wood. For controlling the heating of parts and amount of spreading at different sections, a clay-water mixture was swabbed on with a brush of hemlock branches. A centreline was stretched down the length of the hull and stakes were planted in the ground equidistant from it to the sides to guide the spreading. Spreader poles, longer than the width where they were placed, were pounded sideways to push out the sides. Also, springy poles of cedar or hemlock might be bent and set between the sides to exert pressure outwards as in Coast Salish practice (Durham 1960: 70). The bottom apparently would come up in the middle, and when it was level, spreading was stopped. Without firsthand experience it is difficult to ascertain what actually changed in the hull shape as it was spread. Durham experimented with models but only writes:

> In carving small models of Northwest Coast canoes I have found it beyond my skill to form a hull in such a way as to anticipate the complex changes in shape brought about by spreading. Indian success indicates an abstract feeling for the dynamics of the operation or a detailed system of standard allowances, discovered through generations of trial and error (Durham 1960: 70)

While mystification of the subject is to be avoided, it might be suggested that the master builders likely had quite special knowledge by tradition and experience of the dynamics of hull spreading. Different hull forms, for

example, round versus flat-bottomed, uniform versus varied thickness, may have reacted differently to spreading. Even thickness lessened chances of splitting, according to Charles Jones, although that principle presumably did not preclude some change in thickness as from side to bottom provided it was neither extreme nor abrupt. Actual experience with the spreading of hulls of different sorts would be most instructive on the subject and is perhaps beginning to be recreated by involved modern students such as Bill Holm, Duane Pasco and Steve Brown in Seattle. In the present report some insufficiently confirmed information has been included rather than left out to be on the safe side, partly in hopes that useful clues might be provided thereby for such builders.

Greater beam, the object of spreading, could also be obtained by planking up the sides, considered a kind of patching like the addition of pieces along the top to fill in a defective or damaged section. Built-up sides to increase beam would be planned from the outset of the hull shaping when the log fell short of the projected width of the canoe so that the greatest diameter of the log would be taken for about the middle of the sides rather than their top and the bottom would be taken down much further in accordance with the reduced depth of the original log portion of the hull as it was carved in upside-down position (Fig. 50). It was not necessary to plank up the entire length of the sides, but only the middle portion where the log lacked sufficient diameter for the planned width of the hull. On the other hand, most of the length could be planked as in the large 41-ft. canoe at the British Columbia Provincial Museum in Victoria. Whether for building up the sides or repairing them, the piece to be added was fitted exactly to the gap in the hull, more often than not curved up at the ends to the gunwale, with the charcoal marking

technique. The pegs of any dry wood, commonly yellow or red cedar, were made the thickness of the bone drill, about 3/4 in. perhaps if of eagle bone, and cut to match the total depth of each pair of holes in hull and patch. They were not overly long, perhaps about 4 in. for a large patch and 3 in. for smaller ones, spaced possibly 2 in. or 3 in. apart and expanded with little wedges at the ends. These wedges were set cross grain to the pegs and to the hull and patch wood as well to avoid splitting them. Large patches were hammered into place by two men using heavy yew mallets. If the joint did not close completely, the laugh was on the builder, according to Charles Jones. In such a case, the locked-in pegs could not be extracted so they had to be cut and replaced by new pegs in new holes. Patching was faster if the ends of the piece were fastened not by pegs but by dovetailed, or "bow-tie" as the chief called them, clamps of yew about ½ in. thick and 2 in. to 3 in. long fitted precisely into mortices cut in the exterior surface and held with pitch.

During the first half of May the ends were further tapered to blade-like edges about 2 in. thick. For easy tilting by levering to work on both sides, the hull was raised onto blocks which held it 1½ ft. off the ground so that the sides of the wide central bottom could swing well down in an arc for the blocks were set at the ends under the cutwater-skegs to have the canoe tilt about its central axis. At the stern, the quarters were still too full-cheeked so the major lumps there were taken down with power plane, hand plane and spokeshave. The sides were matched visually and by touch. To see the surface better, they charred it with the blowtorch. Work on the surface would remove the charring, and the burning would be repeated. The bow received further adzing but its shaping could not be as final as the stern's since the prow piece was still not on. On the sides the top sections were smoothed again with the shallow concave dip below the gunwale refined to reach within 1/8 in. of

the top above and to blend in smoothly to the convexly curved middle part of the side underneath, the transition being largely evaluated for continuity by touch. The stern head was marked for deeper hollowing on the rear surface and the chief chipped away below the top flat cap with the D-adze (Fig. 48). The latter was too wide and lopsided, with ½ in. more on the starboard edge, so it was marked and reduced 1½ in. in width to 13½ in. at the front edge and 9 in. at the back. Since the inside required much more finishing at the ends, the canoe was lowered back onto the tie skids for steadiness although the ends were kept supported to remain solidly based for the striking of the surface within. It was difficult labour to clean out the ends inside because of the cramped space and cutting cross grain. The assistance of George Louis was lost furthermore when he left to prepare for the building of a sealing-class canoe for an exposition of crafts at the Ontario Science Centre in Toronto.

The bow head was added in the second half of May. It had been blocked out with chain saw a month earlier from the same 29-in.-thick log used for the stern head, but the thickness of the log was useful not so much for the width of the arms as for the curve up of the prow piece (Fig. 51). The 6-ft.-long log chunk was first cut to block out the profile by Ken Jones, although he had thought of cutting the tapering top outline first, contrary to his father's plan. From 6 in. down on the back face of the log and 2 in. down on the front face, transverse rip cuts were angled down to meet 10 in. down and 3 ft. in from each end, blocking out the upper surface. On the under side a cut was made from the front face 13 in. in from the side to slant out to the surface 4 ft. back. Another transverse cut met it there, having started 4 in. in on the back face. The sides were then taken off to taper the top outline to be 22½ in. wide at the back end and 12 in. at the front. Greater width was not required in the arms since the scarf face on the hull was

normally cut to be 31 in. so that the width at the back end of it was 22 in. A 2-ft.-thick log would probably have sufficed for the head piece. To block out the arms of the prow piece, a large notch was cut into the back in stages with the chain saw 4 ft. deep on top and 1½ ft. deep below, leaving the sides 4 in. thick. The lower rear corner was cut in a convex curve marked with a plywood pattern of the scarf face on the hull, leaving the ends of the arm 4 in. deep to allow for later adjustments in fitting. The sides were cut to narrow in to the bottom edge which was left 4 in. wide for plenty of spare. Concave hollows were cut into the sides with axe and adze (Fig. 52). Thus roughed out, the bow head was set aside while attention was shifted to the stern head, to be taken up again a month later.

The scarf face on the hull was scooped out deeply to have the bow piece sit securely in it. Below it the hull was 20 in. high while the sides were 26 in. high at the back end of the curved cut. An inch-thick dowel was inserted in the scarf face 5 in. back of the front edge to serve as a temporary kingpin for holding the head in place for fitting. It projected only an inch and the head had a hole to fit over it. The kingpin served the same purpose as the shoulder or hook in the scarf noticed by many observers (for example, Koppert 1930: 28, Fig. 16; Olson 1936: 67, Fig. 16d; Swan 1870: 37, Fig. 18; Waterman 1920: 17) and was given the same name qa:heidekop (S), meaning "holds together," by Charles Jones. To lighten the head for lifting on and off the hull during fitting, it was hollowed out inside with axe and adze (Fig. 53). To temporarily tie the head in place, a pair of window sash cord lines were passed through holes bored in the hull side tops about 2 ft. back from the front and around the arms of the head, each line being drawn tight through a loop in its end and fastened by tucking the free length under its tightened portion against the wood (Fig. 54). These tap'chaqsebɬ (S) were ideally of thick elkhide line. They kept the head from bouncing around when you worked on

it, according to Charles Jones, one of whose main concerns in canoe making procedure was to have the work kept steady. With the head positioned by the kingpin and the straps, the chief eyed the bow in profile from 50 ft. away or so and judged it to be too large at its 5 ft. 9 in. length. With the flexible strip he marked the upper edge for sheer and reduced the depth of the prow projection by perhaps 2 in. Sighted from the stern, the bow head was bent over to the right so the centreline was shifted 3/4 in. to the left. Then the top outline was marked with the strip and trimmed to flow into the outline of the hull, a transition occuring from the convex curvature of the latter to the slightly concave curve of the sides of the prow projection. The front of the snout-like tip of the head was marked at a slant which removed the end of the piece from 2 in. in on the top to 8 in. back on the bottom edge. Then a second cut was made from what would be the front edge of the "ears" or peak on top 8½ in. farther back on the upper surface down at a slant to the tip, leaving it 5 in. deep. Viewing the result, the chief found the nose too short, but on the other hand did not want to take the ears farther back for the overall prow projection from the hull now appeared to be too short. Height, at about 46 in. at the ears on top, appeared great enough. The length of the head, reduced to 5 ft. 3 in., would have been better left at 5 ft. 9 in. for the seemingly excessive size would have disappeared with the sharpening of the snout. The head was fitted closely to the hull by first marking the scarf curvature on it with a spacer (Fig. 55), then after cutting to that line, repeatedly chipping off the high spots marked with charcoal. Each time the head was placed on for the charcoal marking, it was tied down with the side straps before pounding with the sledge with a piece of 2-in. by 4-in. lumber interposed to protect the wood.

As the bow head approached its final shape with its lines flowing into the hull's and its end configuration

growing more refined, the canoe seemed to finally come alive, as it were. The top edge was taken down to a new curve for the sides of the hull had been slightly humped at the base of the head and met it at an angle, very slightly. Such attention to obtain a "perfect line" was what gave the West Coast and other well-made canoes of the Northwest Coast their excellent form. Painstaking labour lay behind the fine craft. Increased rake was cut into the front edge of the hull below the head, taking it back several inches more at the bottom, and this cut brought the profile lines of the bow into much clearer view. Previously it had been difficult to visualize the prow projection as the graceful form it was to be. Since the head still had much wood on the sides under the upper edges, it was taken off the hull for narrowing down to a 2-in.-wide lower edge with axe and heavy adze with the sides being scooped out for a hollowed flare. The arms were thinned down to match the hull side thickness below and to a 2-in.-thickness at the gunwale. Top width of the head at the ears or peak had been reduced by increments to 10¼ in. Balancing the top outline to be the same on both sides was begun at the ears after the starboard edge was marked with a yardstick, a common wooden one which could be curved, and trimmed to the line. To mark the port to match the starboard, a centreline string was stretched but it hung too high above the head and the 10-ft. flexible strip was used instead with an edge nailed to the centres of ears and hull bottom, the latter determined by plumb dropped from the centre of a board placed across the gunwales back of the head. This commonsense procedure is mentioned only to show one way to balance the head for top outline, being more improvisation than set practice. Canoe builders improvised constantly in construction techniques, no doubt, to arrive at traditional forms by varying means. The port was trimmed to match the starboard, but the sides appeared too straight and had to be given a slightly concave curve

for the front half of the head the next day. All this work of gradually approaching the final lines of the bow exterior by successive approximations took time, consuming several days.

The front end of the head took shape slowly enough but without undue difficulty. At first Charles Jones attempted to lengthen the snout or nose-like projection by marking the ears to be farther back, but the resulting pencilled profile looked awkward with the upper edge of the snout lacking slant so that the projection seemed to point too horizontally and squarely. Consequently, the snout was left at its relatively short 8½ in. length from tip to peak of the so-called ears when the dipped curve of its top edge was cut in. The bottom edge was cut in a shallow curve back 16 in. to the "heart" lump. Width was first made 3½ in. on top at the tip and 2 in. along the bottom, then reduced to half the amount (Fig. 46). Depth went from 3½ in. at the tip and 5½ in. before the turn up to the ears on top to ½ in. less when the bottom was trimmed upward for the front 6 in., leaving a small step down on the edge below the ears.

Before the reduction of the snout to its final dimensions, the head had been pegged to the hull. The temporary kingpin was removed and its hole in the block on the hull was deepened to about 5 in. while the hole in the head was taken through to the upper surface. With the head tied in place, a small section where the hole emerged inside it was chiselled level and the kingpin of ½-in. dowel was cut to length required. The head was removed to set the kingpin in the hull first with the end expanded by the customary wedge to lock it in place. The upper end was slit for its wedge and the head was fitted on and pounded down. The kingpin top was then expanded with a wedge. The arms of the head were anchored a half a foot before their ends by ½-in.-thick pegs set 10 in. deep. Since the cedar rope

lashings planned for the sides were not yet ready, the temporary fitting straps were left on. The harpoon groove was then cut down the middle of the head at the front with handsaw, D-adze and curved knife to be 1¼ in. deep by 2½ in. wide, sized to take the harpoon shaft without excessive looseness which would make it knock around. The groove surface should have been continued back into a wedge-shaped tongue (cf. Waterman 1920: 17, Fig. 4), but the interior hollowing was brought forward past the point so that the feature had to be chiselled in on the down-slanting surface a foot back of the peak of the ears (Fig. 57). Below it the interior was deepened into a V-shaped trench which, however, was not continued in one sweep to the bottom as was usual because the top of the kingpin interrupted at the bottom of the head.

The edges of the ends were narrowed down to 1½ in. thickness. Sometimes they were capped with a protective strip of hardwood, like yew, and such was contemplated for the Port Renfrew reconstruction but not added finally so that the edges were left rather square and unfinished. At the stern, the scooped flare under the flat cap of the head was deepened and the top was reduced to be 10½ in. long by 12 in. wide at the front and 8½ in. wide at the back. The leading edge of the flat top was notched in the middle 1½ in. deep and 2 in. wide, but the notch did not arise from the meeting of the sides of the interior as was usual and petered out halfway down the depth of the hull. Both ends of the interior of the hull had been brought not to a sharp angle but to a narrowly curved, smoothly blended meeting surface, perhaps from the influence of experience with the building of the more round-ended modern dugout canoes. The notched sections at the ends had become superficial decoration rather than integral construction features although the rear notch could serve to hold the shaft of a paddle planted blade-up in the stern. Also, on the exterior the ends of the lower hull were not as sharp as in most West Coast canoes and did not

flare out as much to the top, perhaps again in part from modern headless canoe influence although inherited family style was also a factor.

As the canoe dried out with warmer, sunnier days at the end of May, cracks developed, not only little inconsequential ones in solid parts, particularly the heads which had been carved from green cedar, but also serious ones which would leak as scarf joints separated. Consequently, contrary to the ideal that pieces were so perfectly fitted together that joints did not require caulking (Swan 1870: 37), they had to be clamped together with mortised-in "bow-tie" patches and the gaps between had to be filled with thin cedar wedges of milled shingles. In addition, commercial caulking of a rubber compound type was applied along the joints. Worst was the bow port quarter where the long crack patch separated badly from the hull wood at the front and the partly rotten section above it fell apart around a knot (Fig. 58). Even such a problem area was patched together with wood inserts and caulking, but it would have been best repaired by also nailing on a "tin patch," precluded from the reconstruction by its museum-like situation whereby the most visible of acculturative materials, such as metal, was to be avoided. Plastic wood, however, was used in quantity to fill in cracks and rotten areas. More traditional was the patching of knotholes with spruce buds and small cedar pegs. New tender spruce buds of the spring, grown especially long and luxuriant, were gathered into a bunch and pulled through a knothole which had had its edges rasped smooth to fill it snugly. Sharpened cedar pegs were then driven in from either side so that their tips intermeshed tightly, crushing the spruce needles which released their sticky resin to glue the whole mass together. In addition, marine glue, formerly pitch, was applied to the surfaces of the patches cut and rasped flush. A knot which did not go through the hull but caused a deep spot of bark was cut out and filled with a fitted cedar plug held with

glue and angled wood nails. Similarly, the transverse chain saw cut in the bottom was filled with a tightly fitted thin board of cedar. Patching the hull to be watertight and smoothing the surface to the final form took the first half of June. Particularly long hours were spent at rasping the interior at the ends where the wood had been chipped out cross grain and also where there had been much filling in of cracks, low spots, and rot.

Cedar branch rope was collected and twisted, as previously described under materials, and the bow head received a lashing on each side through the temporary fitting line holes. On the starboard two holes were bored in the head piece 3 in. above the old fitting strap hole in the hull and 2½ in. apart from each other. On the outside they were connected to the lower hole by ¼-in.-deep grooves to countersink the lashing. The branch rope was started by its tip from the outside through the lower hole and taken back out through the rear upper hole. With the other end anchored by hand, the line was drawn as tight as possible while tapping on the turns it took at the holes inside with a hammer to bend it down against the surface. Then it was taken in again through the lower hole and out by the forward upper hole, and tightened with hammering at the bends, an old file being used under the hammer to drive the lashing in the countersink groove outside. At the forward upper hole, a sharpened cedar plug was driven in from the inside to secure the lashing, permitting the other end of the line to be released at last. Next the line went in at the bottom, out through the upper rear hole, and in again below to finish, both holes being plugged. On the port, only one hole was bored in the head over the one in the hull, and the branch rope was taken through them three times and plugged. This simpler lashing was made ostensibly to show an alternative type. For Clayoquot, a more elaborate crisscross "sewing," with three crosses

on each side of a head-hull joint is recorded (Koppert 1930: 28, Fig. 16). Instead of cedar branch rope, heavy gauge telegraph wire was used in the late period of canoe building, according to Charles Jones, who noted its likely use in the Curtis photograph of a Quinault canoe bow section on the dust jacket of the 1967 reprint of Olson's writings.

Additional Fittings

Paddle rub strips to cap the gunwales were cut from 1-in. by 10-in. milled red cedar boards which were used in place of strips split and dressed from canoe log scrap in order to save time, the reconstruction having run past its original deadline date of 31 March. A 12-ft. board was nailed on one of the gunwales to just cover the rear peg holding the arm of the head with its front end and the inside edge to amidships, for tracing the inside outline on it. When this line was cut with a handsaw, the outside line was marked 2 in. away with a wood block gauge to space the pencil, and sawn out. The fore end of the strip was sloped up on the underside for about 8 in. to fit more easily onto the beginning of the curve-up of the prow. The tip was rounded off with a rasp while the other end was cut square for butting to the next section. Fit was made flush along the length by planing lumps off the gunwale as necessary. With the front section held in place by temporary nails, the rear half of the rub strip was similarly prepared, being cut to stop 8 in. short of the upturn of the stern head elevation where it was estimated that the steersman's paddle sweep would end. After the other gunwale was covered as well, the rub strips were permanently pegged by 3/8-in. fir dowels about 3 in. long spaced 5 in. to 17 in. apart and expanded at both ends by the usual little yellow cedar wedges. The inside edge was

rounded off with the spokeshave. On the outside, the lower edge was trimmed with the curved knife to continue the concave lip-out of the top of the side. The addition of the rub strips increased the beam slightly to almost 4 ft. amidships and the depth there to about 21 in.

Crosspieces were made from hemlock saplings chosen from a dense stand where they grew straight, quite free of lower branches and of relatively uniform thickness from bottom to top, a diameter of about 2 in. being sought. They were cut very roughly to length, leaving much spare for later fitting, peeled clean of the bark which came off easily, and planed level at the little bumps caused by twigs. The first crosspiece was placed amidships, 17 ft. back of the tip of the bow or stem. Its top was to be at a mark made 3 in. below the rub strip on the inside of the hull. Proper fit was obtained by marking the ends to match the plane of the sides with spacers ranging from an inch-thick block of wood through a yardstick end to a carpenter's flat-sided pencil. For lashing each juncture of crosspiece and hull side, four holes in a square arrangement were bored vertically down the crosspiece and four more in the side below in a trapezoidal pattern, the holes being 3/8 in. in diameter. The sequence in which the twisted cedar branch lashing was passed through all these holes was not rigidly fixed, but generally the line was threaded in an upper hole in the side to the estimated required length, about 2 ft., to begin and the other end was for about 3 in. to 4 in. split to half-diameter and turned back down into the hole below where it was lightly pegged to anchor it. The tip of the lashing was then taken up and down through a pair of the holes in the crosspiece, out and in through the hull, through the other pair of holes in the crosspiece, through the hull, and so on until the holes were filled quite tightly and secured at the end by being hitched twice or more around its passages under the crosspieces to draw the

whole tight. The branch rope was hammered down at each bend as it was pulled tight at each pass through the pieces and on the outside was countersunk flush to the surface in chiselled-out grooves. Sharpened cedar pegs driven into the holes in the hull filled them and fixed the lashing. The end of the branch that was split for the initial anchoring was cut flush, and the exterior was filled in with plastic wood at the lashing. If the cedar rope ran out before enough turns had been taken, another length could be added with a plug inserted in the hole to anchor the end.

The second crosspiece to be inserted was placed 4 ft. behind the first, Charles Jones determining that as the spacing between thwarts in the after half of the canoe. The holes in its ends were bored horizontally instead of vertically and the subsequent crosspieces were horizontally bored as well except for the last one at the back which was done vertically like the first. Because the first crosspiece had play in it after lashing, the succeeding ones were first pegged horizontally from the exterior with 3/4-in. dowelling before putting in the lashing which tended to pull them down from the planned height on the sides. The placement of the holes in the hull below the crosspieces was his father's manner of lashing them (Figs. 59, 60) according to Charles Jones, who also said that there were seven different ways to do the job. For the last crosspiece in the stern, however, the holes were placed up on a level with it (Fig. 62), as described by Waterman (1920: 21, Fig. 7). The end of the lashing, on the other hand, was not wrapped around its strands at the crosspiece which would then have the section narrowed into a thinner neck to countersink the wrapping (Waterman 1920: 21, Fig. 7). For the Quinault, Olson says the thwarts were lashed or pegged (1936: 70). The impression provided by the builders was that lashing with cedar withes passed out of common use earlier than pegging or nailing which was practicable

with the later board thwarts.

In the bow a pair of crosspieces were placed where they would best support the harpooner's rear foot when he stood to strike the whale, about 6 ft. back of the prow tip. They were set 2½ in. apart so that when they were notched in the middle to widen the space there, a 3-in.-diameter mast could be stepped between them. Mast and sail were not included in the reconstruction, but had they been, on the bottom would have been pegged a rectangular alder step with a socket for the mast foot, about 4 in. by 8 in. and slope shouldered (cf. Waterman 1920: 21). The next crosspiece was inserted 6 ft. behind the bow pair and 5 ft. before the amidships one, a large space being desirable behind the harpooner's crosspieces, for the floats and float tender among the Makah at least (Waterman 1920: 41, 43, 48, Fig. 14). Behind the amidships crosspiece at 17 ft. and the one after it at 21 ft., two more were placed at 4-ft. spacings at 25 ft. and 29 ft. Lastly, a stern crosspiece was set 3 ft. before the front of the elevated rear head top so that the steersman sitting there on his seat could easily reach the lines from the sail tied to the thwart. This placement left a space of 2½ ft. between the stern crosspiece and the one before it to coincide with the spacing shown by Waterman (1920: 48, Fig. 14). On the other hand, the reconstruction now had seven crosspieces, counting the bow pair as a single unit, whereas six would have been right for a 35-ft. canoe, as Charles Jones noted and Waterman has figured (1920: Fig. 14). Waterman gives a much longer space of 9 ft. for the harpooner's section in the bow where the chief gave only 6 ft. because he intended the harpooner to stand in a safer position with his forward foot deep in the bow on a duckboard there rather than on the gunwale (Drucker 1951: 51).

In the ends of the bottom were fitted sturdy duckboards of red cedar 1-5/8 in. thick to keep the harpooner and

steersman clear of any bilgewater. The bow board was 32 in. long by 11 in. wide at the back, tapering to a rounded-off tip, while the stern one was 29 in. by 16 in. Both were crowned on top to shed water better and supported on short pegs stuck at a slant in the sides. In the stern a 2-in. thick cedar seat was pegged in, 17½ in. long and 14 in. wide, about 10 in. above the bottom (Fig. 61). These three pieces were all split and dressed from excess cedar from the blocking out of the hull and heads, and were given a chipped D-adze surface finish.

Surface Finish and Decoration

The surface was given a smooth sanded finish both on the outside and the inside except where adze marks remained by accident as on the flare of the bow quarters where Charles Jones kept chipping away to near the end of the work. A D-adze finish with regular rows of fine chipping marks was desirable for the interior for appearance's sake, but it was difficult to arrange for the services of a specially skilled carver for the task like Joshua Edgar at Nitinat or Henry Hunt in Victoria. John Livingston, the chief's previously mentioned son-in-law, was willing to assist again for the D-adze surfacing, having mastered the technique under the tutelage of Henry Hunt, but at the time for the job was off to fish salmon with the Kwakiutl. Thus the interior was simply sanded smooth (Fig. 59).

Along the top of the inside a fluting of four concave grooves was cut 3/4 in. below the rub strip (Fig. 63) with a 3/8-in.-wide curved scoop gouge. The fluting was ended short of the ends of the interior space, but could have been turned up to cross over the gunwales at the turn-up of the stern elevation and over the "neck" section of the prow above the "heart" lump on the lower edge so that they could

continue down and around the outside as the decorative collars or "scratch marks" on the ends (cf. Waterman 1920: 16, Fig. 3). The latter were not made, however, and painted bands were contemplated, but in the end they were not added either for lack of a natural clay white. The chief also thought of picking out the fluting inside with white or blue. The fluting was sanded with the sandpaper held over a thin board edge which was rounded to fit into the grooves, and the sanding made them more regular in appearance. Waterman says that the grooves were made with "a special tool resembling a reamer" (Waterman 1920: 18).

More grooves were made on top of the bow head, gouged transversely across the grain, ¼ in. wide and at ½-in. intervals from the "ears" back a foot, stopping short of a slanting V-notched groove cut with a knife to rise from the wedge-shaped tongue of wood under the harpoon notch to either side. The shallow grooves were smoothed with a round file. The decorative arrangement of this area at the top of the prow is clearly diagrammed by Waterman (1920: 17, Fig. 4) and his illustration influenced the grooving in the reconstruction along with the 35-ft. canoe preserved in the Vancouver City Museum which has very fine marks at a rate of five to the inch flanking the harpoon notch.

The exterior surface had been charred as early as the shaping of the bottom to cut down the reflected glare in order to see the "lumps" better for levelling. As the fine shaping of the hull proceeded, the charred surface of the sides was removed a number of times, particularly at the ends which were more progressively narrowed, so that the scorching had to be repeated. For the final burning, Charles Jones decided that he would like to have the bottom and sides halfway up to be black while the upper part of the sides would be brown. To demarcate the two sections, a piece of sheet metal was held on the upper half while the lower part

was burned black, after which the top was lightly scorched. The charred wood was wiped to remove excess charcoal, then brushed liberally with boiled linseed oil which turned the scorched upper section a deep rich brown colour. Fillings of plastic wood and caulking compound at cracks, patches and lashings which did not darken much with the burning were later painted by the chief to match the rest of the surface. The Makah are described as having usually charred the exterior but sometimes rubbed on charcoal and oil, likely dogfish oil, or decayed salmon eggs, and also at times a black swamp muck (Swan 1870: 37; Waterman 1920: 22). The interior was traditionally painted with red ochre (Swan 1870: 37; Waterman 1920: 23; Koppert 1930: 26). A local variety was tried but looked dull and did not adhere well so a commercial mahogany stain stretched with the linseed oil was used instead, imitating not the ochre but the preservative stain prepared from alder or hemlock bark. The latter materials were available, but not the aged urine required in quantity for the best penetration.

Accessory items would have included paddles, bailer, mast, sail and stone anchor, but only a paddle was prepared as a sample pattern out of red cedar, which is too weak for real use, copying an example in the British Columbia Provincial Museum. The bailer, of alder, is well illustrated by Waterman (1920: 28, Fig. 10). Charles Jones had an example made by his father of alder which was well preserved with bark stain. The whaling harpoon shaft, head, lanyard, lines and floats have also been covered fully by Waterman (1920: 29-38) and information from the present reconstruction can add little.

Canoe Usage

Canoeing Techniques

Since canoe usage was not observed, the Port Renfrew reconstruction not even being launched for a trial run, the information in this part is drawn from recollections and is meant only to supplement existing accounts which often draw on actual observation. For launching, the whaling canoes, along with the sealing and sea-otter-hunting canoes which had polished bottoms, were carried to the water on poles while more ordinary craft were moved on skids or simply dragged on sand. In loading, the centre of gravity was set slightly to the rear, according to Charles Jones, to have the canoe ride with the bow a little higher than the stern for better control. In smaller canoes the occupants knelt on the bottom, sitting on the heels of their inturned feet (Drucker 1951: 86; Sproat 1868: 84). In big canoes the paddlers sat on the thwarts or stood (Drucker 1951: 86), while for whaling canoes Waterman records a special arrangement in which each pair of paddlers sat on the end of a mat which was turned up over the thwart from the back to form a wall which kept articles in one compartment from shifting back into the next (1920: 41). He also mentions fitted bottom boards of cedar with spaces left between them to permit bailing (Waterman 1920: 21). Odd boards and mats could also be used to cover the bottom, and for Clayoquot, Koppert says that white pine branches were spread loosely near the middle of the canoe (1930: 28). Paddling is described by Drucker:

> In the smaller canoes, a paddler stroked on one side, giving his paddle a slight outward thrust by levering it against the gunwale at the end of each stroke to maintain course. Now and then he shifted sides to rest. In the large canoes the paddlers used straight strokes, except for the steersman whose strokes were aimed not at propelling the vessel but at steering it. The steersman was in charge, and in close maneuvers or in heavy weather shouted commands as necessary (Drucker 1951: 86).

He also records that men and women could be distinguished at a distance, even when hats and capes were alike formerly, by their paddling, men pulling more with the lower hand while women pushed more with the upper due to the difference in strength. Which is not to say that women were weak, for, as Ida Jones recalled, some wives rowed, in later times when oars became common, while the husband just sat in the stern. Skill might be insufficient, however, for the man to impose such servitude, as with Mrs. Jones who could never keep direction in rowing or poling on the river. Paddling was not done to a regular stroke in unison ordinarily, but on grand ceremonial occasions before the village, canoes would be ranged in order and paddlers kept time to a stroke caller or a chief's song, perhaps arranged to the situation as a paddle song, using an exaggerated stiff stroke that made the craft bounce along (Drucker 1951: 86; Sproat 1868: 83).

Large waves were crossed at a diagonal rather than perpendicularly to avoid splitting the hull by leaving a part of it unsupported (Drucker 1951: 86; Olson 1936: 73). In heavy weather inflated bladders or sealskin floats were sometimes tied to the sides to prevent upset (Sproat 1868: 83). If a breaker threatened to curl inside, it was cut horizontally through the top with the paddles to weaken it (Sproat 1868: 83; Drucker 1951: 87). Landings were always made stern first among the Makah and Quinault to have the larger bow head protect against swamping by heavy surf, according to Waterman (1920: 18-19) and Olson (1936: 73),

but on Vancouver Island bow-first landings were normal, according to Charles Jones. Sproat writes:

> Their mode of landing on a beach through a surf shows skill and coolness. Approaching warily, the steersman of the canoe decides when to dash for the shore; sometimes quickly countermanding the movement, by strenuous exertion the canoe is paddled back. Twenty minutes may thus pass while another chance is awaited. At length the time comes; the men give a strong stroke and rise to their feet as the canoe darts over the first roller; now there is no returning: the second roller is just passed when the bow paddler leaps out and pulls the canoe through the broken water; but it is a question of moments: yet few accidents happen (Sproat 1868: 83).

It was possible to surf in, of course, as Chief Jones once did when young together with another boy, hitting the beach dead on and splitting the bow of the pirated craft. The proper technique was to surf in, turn the stern slightly near the end of the ride and let the sea turn the canoe and wash it up on shore, there being a special term for the condition, paqw'eiyab (S - C.J.). If the canoe hit the beach and stopped, it was paqw'est; if turned crossways, paqw'esedabt, and the next wave would wash it up higher. A well-developed vocabulary existed, as might be expected, for all the variegated aspects of canoeing.

As in landing through surf, in running before heavy following sea, the canoe could go with the bow at the back for protection (Drucker 1951: 87). Normally a following sea was ridden more easily than seas met head on, so that the stern head-piece could be smaller (Waterman 1920: 18). The heads were refined to be the minimum bulk needed for the job, as Waterman notes:

> Both bow and stern-pieces are so slender that they hardly seem adequate to keep off the seas. They have probably been reduced, as the result of long usage, to the slenderest design which will fulfill the purpose. Yet even in their present form they are highly useful. I dare say that their reduction to their present slender proportions has been equally for the artistic effect of delicacy,

> and for the practical consideration of reducing the total weight of the boat. The Indians have reached in this feature of the canoe what seems to my mind the highest artistic success, the making of what is a commonplace and practical contrivance, also artistically beautiful (Waterman 1920: 19).

As finely designed as the West Coast canoe was for riding the sea, it could swamp or capsize. Particularly dangerous were the entrances to rivers and fjords where bars often formed, creating shallows where waves break. Tide and river currents, wind and waves conbine into treacherous conditions as, for Southern West Coast examples, at the entrance to Nitinat Lake or, more accurately, Fjord, and the mouth of the Gordon River in San Juan Bay. The water along the coast is the very cold Alaska Current and in case of upset or filling, even the acclimatized natives sought to make shore quickly. When a canoe filled, it went down under but then slowly came up again. Many, however, panicked and forgot this characteristic. Traditional advice was to hang on to the paddle in case of foundering since it was faster to paddle even a swamped canoe ashore than to swim in through the surf. Such paddling had to be done inside the filled hull, pulling straight toward oneself and between the legs which were well spread as one sat on a crosspiece. When a canoe of any size, say 20 ft. or longer, capsized, continued Charles Jones, it could not be righted simply by pulling it up by the gunwale amidships for a man could pull it up only so far before the suction created inside held the hull down strongly to the water surface. The righting procedure was to get on the bow and pull on the cutwater blade while at the same time pushing away on the head below with the feet, any partner, if available, doing the same at the stern. The interior suction would be broken with a loud sound of inrushing air. Since the righted canoe would still be full of water, it was turned broadside to the waves and rocked to bail it out. Left lying end into the waves,

it would keep filling. One watched for a calm space between the waves to rock the canoe, standing inside and holding onto a crosspiece perhaps. With three or four rocks, a sheet of water 10 ft. or 12 ft. long and several inches thick would go out, giving some freeboard. After the rocking was repeated a couple more times, the bailing was completed by hand. The bailer might be tied to a crosspiece anticipating emergencies. Boys used to go out and deliberately upset to practice capsize recovery.

Besides being paddled, canoes were poled to go up rivers. Drucker (1951: 87) says that rivers were ascended stern first since in poling most of the steering had to be done by the forward man and if the bow were forward, its projection would be in the way. He also says the bow, because of the weight of the large head, swam deeper than the stern, although it would seem that the load could be shifted to compensate as desired. Poling can be fast, of course, and Sproat writes: "I have seen an Indian boy with a single pole make good way with a small laden canoe against a stream that ran at a rate of six miles an hour" (1868: 82). When rowing with oars became common is yet to be established with precision, but it may have been widespread by the turn of the century. Small wooden blocks were mounted along the gunwale on the inside and pierced widthwise so that the hole for the metal oarlock slanted out with the flare of the hull, by the detail in an undated older photograph of large canoes beached possibly around Victoria (Fig. 64). Rowing was less tiring than paddling, as Charles Jones explained in describing rowing for long hours after fur seals in the Bering Sea.

Sailing was adopted from Europeans by the beginning of the 19th century it seems for when the Boston was captured in 1803 near Friendly Cove, Chief Maquina, or, properly, Mokwina, besides sparing Jewitt the armourer for his metal working, on being presented with the other survivor, Thompson,

"...immediately knew him to be the sail-maker and was much pleased, observing that he could make sails for his canoe" (Jewitt 1967: 27, 34). A square sail, actually rectangular, was used first, made, for lack of cloth, from coarsely woven cedar bark matting with transverse poles for yards at top and bottom. An example 5 ft. 7 in. tall by 3 ft. 1 in. wide is described in detail by Waterman (1920: 24-5). A halyard of twisted sea lion gut line ran through a cedar withe noose at the top of the mast or a hole in it to hoist the sail which also had lines to control it at its corners. Sails were small to avoid capsize, but quite sufficient for the narrow-bottomed canoes and the stiff yew or fir masts 14 ft. to 15 ft. long did not need stays. Later the sail was placed to one side of the mast and held out by the upper outside corner held by a loop to the end of a boom which slanted up from the mast at a point by the lower part of the sail. Koppert figures such a sail of mat, 6 ft. tall by 4 ft. wide, held to the mast by cedar withe loops 10 in. apart (1930: 34, Fig. 24, 35). If this lug sail was of cloth, canvas or calico, the outside edge might be cut on a curve adding about 4 in. width and the top about 2 in. higher in a curve, according to Charles Jones, so that when the edges drew straight in the wind, the sail ballooned slightly for more power. More recently a gaff sail was used, about 12 ft. high along the mast where it was held by rings, 4 ft. on the slanted-up top stick which was held up by the halyard, and 14 ft. along the bottom which had to be bigger than the height so that reefing the sail on the boom up to the first ring about 1½ ft. up on the mast quickly took away the lower quarter of the sail area when a strong wind came up. Large canoes, 35 ft. or longer, were sometimes set with two sails, the masts being stepped in the bow and amidships through heavy board thwarts replacing the old pole spreaders (Fig. 65). Three sails were tried on the largest freighters but were found excessive, the canoes going too fast and shipping water.

Even with two sails, the chief recalled, his father's freighter ran so fast before a strong wind that it plunged from wave to wave on the crests. In the later 1860s Swan wrote of the Makah, "Some Indians have adopted sprit-sails, but they are not in general use, nor are they as safe or convenient for the canoe as the square sail" (1870: 38). There must have been reason for the change beyond fashion alone and it may have been the development of tacking, said to be done by Charles Jones. His information raises a problem because it has been repeatedly stated that the flat-bottomed West Coast canoe could not tack, as in Waterman's statement that "Progress by tacking is impossible, as the boat would make more leeway than headway" (1920: 26) or Drucker's, "The Nootka canoe was poorly suited to sailing, of course, without true keel or centerboard, and would sail only on the wind" (1951: 86). On the other hand, the chief maintained that the cutwater-skegs or sipo:s at the ends of the bottom acted sufficiently like a keel to allow tacking. Experiment is in order perhaps.

Storage and Renewal

Canoes had to be protected from the sun which would check and split the cedar and might "in a few hours ruin a good boat" (Waterman 1920: 26). Mats, blankets, boards, or branches were used to cover hulls on the beach. Coats of dogfish oil inside and out helped resist sun check so that canoes could be left in the sun. Thin-hulled racing canoes, however, were to be always kept in the shade. Some whaling canoes were even kept inside. For lengthy storage, it was best to keep the canoe upside down with the sides nailed amidships so that they would not spread of their own accord under the weight of the hull. Storage on the side was easier to arrange. The ends were blocked up and asymmetry could develop from the weight in which case the amount of off-centredness was measured from a centreline and the hull was

turned so that the straight side was put on the bottom. A block of wood was set below amidships at the proper height allowing for the correction of the assymetry which would come about through the weight of the canoe. When the bottom became rough through use, it was burned again to take off the slivers and renew the crack-resistant charring. Cracks were caulked with finely shredded cedar bark and pitched (Drucker 1951: 88). The surface was rubbed smooth with old matting, grass, or fir or cedar twigs (Drucker 1951: 83; Swan 1870: 37). Oiling could be renewed as well.

Fishing and Hunting

Little can be added to existing descriptions on the canoe's part in fishing and hunting for most of which it served as transportation in an uncomplicated way. Trolling for salmon has been described by Jewitt as follows:

> One person seats himself in a small canoe, and baiting his hook with a sprat, which they are always careful to procure as fresh as possible, fastens his line to the handle of the paddle; this, as he plies it in the water, keeps the fish in constant motion, so as to give it the appearance of life, which the salmon seeing, leaps at it and is instantly hooked, and by a sudden and dextrous motion of the paddle, drawn on board. I have known some of the natives to take no less than eight or ten salmon of a morning in this manner, and have seen from twenty to thirty canoes at a time in Friendly Cove thus employed (Jewitt 1967: 68).

Of other fish, the halibut was of particular importance as food. The refined rig and techniques used for catching them can scarcely be broached in passing and merit separate treatment. Canoes could be filled to capacity on an outing. The biggest halibut weighing hundreds of pounds could be taken aboard only by tipping the canoe to put the gunwale down on the water and rolling the fish over the edge, then righting to slide it inside (Drucker 1951: 45).

Sealing was also described in sufficient detail by Charles Jones due to his firsthand experience with it on the Bering Sea that to present all the information within the present account would unbalance it, whereas to present only bits seems inadequate. It might be repeated, however, that the seal-hunting canoe was originally built narrow for speed, about 3½ ft. wide for perhaps about 24 ft. length as was preferred by the chief's mother's brother. For the commercial fur sealing of the late 19th century, the canoes were made beamier, about 4 ft. wide, for greater capacity to carry up to two dozen seals, and shorter, about 18 ft. to 20 ft., to fit on the schooner decks where they were carried two to a side stacked one above the other. The use of sail and oars compensated to a degree for the loss of sleekness. Commercial sealing depended on a combination of the schooner to reach the Bering Sea sealing grounds and of the canoe for the hunting itself. Besides the obvious immediate economic involvements, the business enlarged the West Coast world view in certain directions when some seal hunters came to visit far off places in the Orient and the United States, as well as southern Alaska and the Aleutians.

Whaling, the canoe usage of greatest relevance to the Port Renfrew reconstruction project, was known to the builders only through recall since the traditional form had passed away before their time. Little can be added to the detailed accounts written by Curtis (1916: 16-40, 103-10), Waterman (1920: 29-49), and Drucker (1951: 27-31, 48-56, 164-80), not to overlook the less professional Swan (1870: 19-22), all of whom could interview whalers or even observe their practice. Whaling technique began with magico-religious procedures in the native view (I.J.) as Waterman recognizes when he says that "...the really important matter is the proper observance before and during the hunt of various ceremonial performances for procuring help from the spirits" (1920: 38). Preliminary

preparation, which might begin several months before the season, included continence for the crew, arduous ritual bathing with hard scrubbing with branches or roots of certain trees, each family having preferred species, to toughen the skin and harden the flesh as well as for cleanliness, and magical rites to gain power over the whale. Secrecy surrounded the procedures which were carried out at night while everyone else slept. Also, the crew was to be all in the family since outsiders might deliberately sabotage proceedings to deny success with its attendant prestige.

The whale, commonly the California gray which regularly migrates along the West Coast, was fast, moving at about five knots, according to Charles Jones, so that the crew had to paddle hard to come up to it on its left side. Eight men were ideal for the crew; six paddlers, steersman, and hunter. As the canoe closed in, the last stood with his right foot back on the first crosspiece and his left in the bow at the front of the duckboard in the safer low position for harpooning advocated in Charles Jones's family. Drucker describes the left foot as being on the gunwale close to the prow head for the Ahousat (1951: 51) while for the Makah Waterman says the right foot was usually forward of the bow thwart, presumably on the gunwale, and the left on a pair of short braces in the stem (1920: 42). Evidently there was tribal and family variation in this as in other techniques. The heavy 16-ft.-long yew harpoon shaft was held with both hands palm up and out among the Makah (Waterman 1920: 43) and Pachena (C.J.), the chief's grandfather noting that to have the left hand on top in front would tend to pull the throw off the mark, although Drucker records this grip (1951: 51). He also writes: "It was necessary to come very close, for the harpoon was thrust, being too heavy to throw " (1951: 52), but Charles Jones said it was thrown. Swan writes that harpoons were thrown (1870: 20), but Waterman talks of striking downward although he mentions that the first paddler on the starboard

had the right to give the word, "now throw!" (1920: 43). Both Drucker and Waterman record that the best time to strike was just as the whale was submerging, turning over to go down, for if struck prematurely it could smash the canoe with its tail thrashing on the surface. Since the harpooner could not watch the tail to the rear, the steersman signalled when to strike by its position, which was to be to the whale's left, to the canoe so as to swing away in reaction (Waterman 1920: 43). The chief's grandfather preferred to harpoon while the whale was three to four feet underwater because the flesh was relaxed then and the head penetrated better. When the whale was surfaced, the armpit was the mark to hit the heart or lungs where a strike would find the whale getting progressively weaker at each subsequent surfacing, with the blow lessening and sometimes being mixed with blood. Pachena and Makah whalers sought to hit the kidney or liver where the animal would stay strong at first, then weaken. A spine strike was also good with the whale dying quickly. With more than one canoe present, there would be a race to harpoon first. The harpoon could go about five feet deep with its sharp mussel blade which might shatter, not that it mattered since the bone or elk antler barbs were the parts that would hold on the line and floats (Waterman 1920: 32).

When the harpoon struck, the first paddler at once threw out the first sealskin float which was small so that resistance would not be suddenly great, possibly dislodging the head. Of the six or eight floats ideally tied to the line, the last was largest, 5 ft. to 6 ft. long by 1½ ft. to 2 ft. thick, yet it would be pulled along 3 ft. to 4 ft. under with only its end showing. At the strike, the port paddlers backed water to turn the canoe away from the whale and let the line pay out on the starboard. The harpoon shaft came free and was retrieved to be armed for another strike or to send ashore by another canoe, perhaps a swift sealer, to notify

the village (Drucker 1951: 53). Behind the last float were three or four fathoms of trailer line which could be tied to short lines from the first and last crosspieces, by slip knots for quick release if the whale sounded again. Other canoes attached additional lines and floats impeding the whale and keeping it at the surface for lancing. Swan writes that with a number of canoes it was not unusual for 30 to 40 floats to be attached to a whale (1870: 21), while Waterman says as many as 13 might be tied to one line (1920: 43). When the whale died, a song might be sung to activate it again to head to shore and decrease the towing distance. A diver closed the mouth with a line passed through holes in the lower and upper jaws to keep the whale from filling with water. A number of floats could be attached to keep the carcass from sinking. The arduous tow to shore might take a couple of days and magical songs were sung to ease the task. Although Drucker says "...the prestige value of whaling outweighed its economic importance" and that "...the economic reward in proportion to the expenditure of time and energy was slight" (1951: 49, 50), it should not be forgotten that a whale yielded a great amount of meat and oil prized for their taste. For the Makah at least, Swan says the most important sea resources were the whale and halibut (1870: 19).

In connection with whaling, Charles Jones related the following didactic story: The harpoon float was relatively small, about 2½ ft. long only, made from the whole skin of a five- or six-months-old harbour seal. The seals are born in mid-August so for floats they were hunted in winter. A canoe was once out whaling toward the end of the year, in early November when the weather is changeable. A whale was harpooned and it took the canoe far out to sea. Then it was dying and everything was made fast, with the mouth tied shut for towing. The other "standby" canoe, present as usual, also made fast, using a separate line as was always done since if the two canoes tied up together, there would

be too much jerking in the section of line between them. The waves began to break over the bow of the first canoe, so its captain said to put a float in the front, which the man in the bow did, stepping on the float to jam it inside at the bottom. In only about half an hour, the canoe split. How a mere float could split a canoe was not known, but it always did if jammed in the bow in that way. Consequently whenever one was put in the bow, some of the air was first released.

The last whaling on the Southern West Coast was done by the Makah in 1907, according to Charles Jones, the Pachena and Nitinat having stopped earlier. It may have been the revival mentioned by Curtis (1916: 40). Henry St. Clair towed his canoe out to the Swiftshore bank with a gas boat and apparently got several whales that last year. He took four or five hours to tow a whale in, but by paddling alone it might have taken a day and a half. One might be fortunate and catch a long tide in. Swiftshore was nine miles from Neah Bay and the Makah whalers used to leave a little after midnight, paddling out there in two and a half hours to arrive at daybreak and have the long day for towing home. The chief once watched a whale feeding on herring there, swimming round and around the school to create a vortex which packed the fish near the surface, then coming up from below with open mouth. A year or two before St. Clair's last hunt when several canoes still went out, a young man called James Philip, who later took his father's name of Ladder, took photographs of the whaling of which Charles Jones knew of seven or eight good shots of harpooning, throwing out the bladder, etc. Probably they are lost, but there is the well-known shot of the whaler Nukbis (I. J.) poised to strike with a second harpoon (Fig. 67). About the same time, in 1906 or 1908, the last whale was taken in the traditional way by the Ahousat, Atliyo:, or Ahousat Amos, getting a sperm or

chichichwon, "mouth right to the belly," according to George Louie. This Atliyo: was Drucker's main informant for whaling (1951: 49) and his cousin was Hesquiat Amos. He was the last whaler at Ahousat to build his own canoe. Later whaling yet was done in the 1920s in Barkley Sound by John Moses of Sarita, according to Charles Jones. The Ahousat got their next whale only in 1963 when one was spotted near the village and harpooned with a 1½-ft.-long iron harpoon by Edwin Frank from a fishing boat. A match stick was inserted in the hole to hold the toggling head straight, said George Louis who assisted in this last whaling.

Travel

With sails, canoes could travel fast and far before fair winds. Charles Jones's father was said to have once gone from Port Renfrew to Seattle in a large freighter set with two sails in a day (C.J.). The chief once went from Jordan River to Victoria on a fast sealer to make a canoe race, leaving about 9:30 a.m. and arriving about 12:30 he said. At Otter Point the tide changed contrary to the wind to create chop so that the canoe jumped from wave to wave and nosed down, swamping. The steersman was good, bailing and steering simultaneously, watching the sail, course, and the water coming in. For such conditions, the bailer was tied to the canoe by about 2 ft. of line. For such maximal speeds of perhaps 10 to 15 knots, the canoes must have been planing on the surface which is possible when they were unladen as in the two instances cited for they were lightly built in proportion to their size and had fair bottom surface. Jimmy Thompson of Nitinat was once lost about 150 miles off the Queen Charlotte Islands for a day and a night before making land on the north end. After five days there, foodless, he started on the sixth when he had a chance to leave, passed

the two islands, crossed to the mainland, and sailed to Vancouver Island, making Kyuquot, the northernmost West Coast village, late the same night (C.J.). If the speed seems incredible, the journey remains remarkable for the distance for a canoe which apparently was not especially large. Under more customary conditions, Swan says that the hundred miles between Neah Bay and Port Townsend on the south side of Juan de Fuca Strait was made in a little over 24 hours in summer, presumably without stopping, but could take seven days in winter, while the average passage was about three days, including two nights camping (1870: 38-9). His contemporary, Sproat, writes: "...two natives can easily paddle a middle-sized canoe forty miles on a summer day" (1868: 84).

Sproat also says, "The Indians paddle best with a little wind ahead; when it is quite calm, they often stop to talk or look at objects in the water" (1868: 84). Obviously they were more leisurely in their travel than the Victorian whites. Travel was generally along the coast, as Swan notes of the Makah:

> In cruising on the Strait they usually keep well in shore, unless they intend to cross to the opposite side; and, if the canoe is large and heavily laden, they always anchor at night, and for this purpose use a large stone tied to a stout line. Sometimes they moor for the night by tying the canoe to the kelp. When the craft is not heavily burdened it is invariably hauled on the beach whenever the object is to encamp. If the wind is fair, or they have white men on board, they will travel all night, but on their trading excursions they usually encamp. which causes much delay in a journey (Swan 1870: 38).

Landmarks were much used when travelling along the shore. Even when out a way, the peaks of the mountains could be seen in clear weather and, indeed, they were the means of locating some of the farther fishing banks although they could be hidden by the frequent fog of the area or darkness. However, whaling canoes might go out of sight of land. On navigational techniques Waterman writes:

> On the high seas at night, the Makah steer by the Pole-star. They never get lost, even in a fog, for they are helped by the swells and the wind. In this part of the Pacific the heave runs pretty consistently west and east. They know by experience also that thick weather comes on when the wind is from the southeast. So if the weather is thick, they conclude that the wind is from that quarter. Clear weather, on the other hand, is usually accompanied by winds from the west (Waterman 1920: 47).

Familiar with such guides, some also came to use the compass in more recent times.

A special form of travel was that of the seasonal moves geared to the varying occurrence of food resources, notably the salmon runs, and weather, whereby summer tended to be spent on the open coast for halibut fishing and whaling among other things while winter was passed in more sheltered deep bays and up rivers. For these moves, a pair of large canoes were put together into a raft bridged with house planks, as these were taken from place to place while heavy pillars and beams stayed put. For short moves on calm waters, as on Nitinat Lake, the planks could be simply laid across the canoes and held them together by their weight and that of the household baggage and passengers, but otherwise the raft had to be tied together. According to Charles Jones, two saplings several inches thick were tied to the front and back crosspieces, and the two outermost planks fore and aft were tied to the saplings, the rest coming in between. The planks were arranged to have their grooved edges overlapped, as when they were on the house, to exclude water from below for a dry platform. People lived on board for days, travelling a little at a time and anchoring in coves at night. A shelter could be built on board and there was even a fireplace made by laying down split green hemlock or alder in a rectangle raised off the house planks and covered with a layer of gravel for the firebed. When the planks in the middle got too hot from the fireplace, water was sloshed on them to pass

right under the fire. A smaller canoe stood by the raft and was used for fishing, cod, red snapper and black bass being commonly caught. The move by canoe raft was made slowly in short stages because the people enjoyed it, according to the chief who remembered sitting by the fire on board and thought it would be something really nice to experience again if only it were possible. Drucker mentioned that with a fair wind, several wide planks were propped on edge at the front of the platform for a sail (1951: 88).

Racing

Races on water no doubt occurred as soon as there were boats and canoe racing was probably one of the traditional West Coast athletic contests (Drucker 1951: 448). Children raced both with toy models and actual small canoes. A special form for boys to race existed in the lopsided canoe which Charles Jones's father made for him to be about 12 ft. long by 2 ft. wide, with the bow off half a foot to one side. Such a craft went to its narrower side and the harder it was paddled, the more it turned. In the race, two canoes were paired so that they would turn into each other and collide. The idea must have arisen from normal canoes which were lopsided.

On the organized canoe races of recent times with their specially developed craft, John Dewhirst has written an excellent essay, "The Salish Racing Canoe" (1967), and present remarks on the subject are only meant to be subsidiary. Dewhirst establishes that these races began in the late 1860s as part of the Victoria Day celebrations in Victoria which included water sports, principally rowing and sculling (1967: 44). Native "war canoe" races were usually done with West Coast freighters and fishing canoes, he says; perhaps whaling and sealing types in particular. Crews became limited to 11 perhaps to cut down on prize money for the originally

unlimited crews. The Coast Salish, particularly the Sanetch near Victoria, lengthened and narrowed the West Coast style canoe into the modern racer, writes Dewhirst, likely through the inspiration of white rowing shells very popular in the 1890s and 1900s (1967: 45-6). Canoe racing became a special Coast Salish development. Charles Jones participated in races on the Gorge in Victoria, having Salish connections. He noted that there was a limit to the thinning of the racer hull for lightness because of the twisting strain on it in the turns. The captain in the stern would be able to see the canoe warping, the bow one way and the stern the other, and would tell the paddlers, "Not so hard!" when he judged the hull to be taxed to the limit. Canoes did split rounding the island in the Gorge in the Victoria races even though that turn is quite gentle. Fastest in the turn in the chief's day was a canoe full of knots and while it wasn't known for certain, they could only think that the knots which entailed crooked grain made the hull stronger and able to stand more strain when turning. Recently at Neah Bay, whose Makah now race against the Salish tribes, he noted that one canoe he examined while it was upside down on the beach had 28 knots just along one side and thought that the builder had purposely made a knotty hull. At Nitinat, Frank Johnson once made, circa 1900, a racer in which flat side and flat bottom met relatively sharply so that the hull was "like an apple box," according to Charles Jones. At the Gorge it went well at first for about 200 yards, then swamped and sank, whereupon the crew got out and left, each taking his paddle, leaving the builder with his failed canoe which he simply pushed out into the water. The recommendation was, of course, that the sides should meet the bottom in a gradual rounded transition, as in traditional West Coast canoe design. Also, West Coast men kept saying that a wide bottom was superior for racing because the canoe would draw little water and idealized the traditional whaling canoe in this respect.

The specific example of a racing canoe having insufficient bottom width that was cited by Charles Jones was, oddly enough, one built by an old Nitinat builder, George Gibbs. It was the Pachena Princess, a five-man-size racer ostensibly derived from the sealing canoe, 22 ft. long by 32 in. wide on top, 17 in. wide on the bottom, and 12½ in. deep. With five men in it, the canoe drew about 5 in. to 6 in. in the water, leaving little freeboard so that it filled in rough conditions at Port Alberni. Also, the stern dug in at speed. Gibbs considered adding to the freeboard, but the racer was retired after three unsuccessful contests. At Neah Bay about 1953 a sealing canoe by Gibbs, apparently different from the racer, about 24 ft. long, according to the chief, went against a larger Makah craft about 28 ft. long and 4½ ft. wide, between the sealing and whaling classes, which drew only 2 in. to 3 in. water with only five men in it, and won. The Salish racers are narrow at about 30 in. to 32 in. beam amidships (Dewhirst 1967: 53-6), but their great length of about 50 ft. provides the displacement needed to carry the 11-man crews. The difficulty in rounding the buoys entailed by the great length is recognized by some as a drawback and Charles Jones was approached by a Sanetch man during the whaling canoe project to build a slightly shorter racer with a wider bottom. As usual, racing canoe design must be a compromise.

Canoe Making

Boys began canoe designing at about 8 to 9 years, starting with flat models made from split cedar boards. For racing, the length and beam were set to be the same and sail power was matched in terms of salal leaves, usually two. The boy designer could alter the outline of the hull and the placement of the splint mast, at the bow or farther back. A thin sliver was set in a split in the stern for a rudder.

One design would outspeed the others and the winner would hide it from his competitors. They would modify their designs and eventually all attained speed. Later the boys advanced to making hollowed-out canoes about 16 in. to 18 in. long. One of them at Nitinat who always won with these models was Henry Tait, younger than Charles Jones but dead in the early 1960s, and at the finish he would pick up his canoe, remove mast and sail standardized at two playing cards, and leave letting no one see his hull bottom.

"You have to start small," said Charles Jones of learning canoe building. When he followed his father into the woods once when about nine years old, the father said he hadn't come for nothing, bucked a log for him and had him trying. His father did not tell him how to make canoes in any explicit set of instructions, but just said for him to go ahead and try making one as the son had seen him doing and that he would watch. "The uglier it is, the better for you," he said, for then the son would learn from his errors from one attempt to the next. To master the craft, one had to work on three canoes in Charles Jones's judgment. But it was not until he was about 30 and married that he got a D-adze, a curved knife and a hatchet, and tried making a small canoe. Perhaps the most difficult part was shaping the bow. All the West Coast canoe builders, said the chief, couldn't get it into shape before the head was on. Although they might get the stern right from the beginning, at the bow they always had to take more off after the head was fitted. Martin Charles of Klaniwa had made perfect heads and many of the Nitinat builders learned from him for he had the proportions just right. When Gillette Chips of Clo-oose made a small canoe perhaps about 12 ft. to 14 ft. long with the traditional ends, example must have been lacking for he had to make three bow heads before one was satisfactory, and buried two of them. The last of the traditional canoe makers at Nitinat,

besides Martin Charles, were Frank Johnson, whose grandson Ernest continues the family tradition of sharp-cornered hull in models and modern "rowboat" dugouts; Sam Edgar, who built a racer in which Charles Jones was bow paddler in the early 1920s and whose son Joshua can still make modern dugouts with nicely rounded cross-sections; Jimmy Chester, who could build very quickly and ably; George Gibbs, who lived to a very advanced age in the mid-1960s, and Sam Campbell, who moved to Port Alberni and who was also long-lived.

With mastery of the craft, some canoe builders displayed virtuosity. Several at the canoe making centre of Clayoquot reportedly got two canoes out of the same piece of wood by leaving a large block inside a big hull for a small canoe, perhaps about 14 ft. long. The trick was to wedge out the inside piece without the split running into the outer canoe. The builders did it just to show that they could. While straight-grained cedar was usually sought, Sam Edgar at Nitinat once made a canoe from a log in which the grain was so twisted that it spiralled completely around. Most took months to complete a canoe, but Jimmy Chester, with the assistance of a couple of sons, once finished a medium-sized craft in less than two weeks. He had an extensive set of tools. Sproat writes: "The making of a canoe takes less time than has been supposed. With the assistance of another native in felling and splitting the tree, a good workman can roughly finish a canoe of fifteen or twenty feet long in about three weeks" (1868: 87). But more usually, "The time for making canoes in the rough is during the cold weather in winter, and they are finished when the days lengthened and become warmer" (1868: 86), just what happened by chance with the Port Renfrew reconstruction. Much longer time was spent by O:dayo when he spent three years building, singlehandedly, a giant canoe at Nitinat 55 ft. long by 6 ft. wide approximately (Fig. 69). A slow but

meticulous craftsman, on the backhand swing with the D-adze, he used to turn it out with a flick of the wrist at each stroke to throw off the chip. Meant for plying Juan de Fuca Strait, the big canoe proved unmanageable in tide and wind in its trial run and was abandoned. More practical was the widest canoe built in the region, at Sarita, out of two matched logs joined lengthwise to give a beam over 8 ft. Length was only about 35 ft. Set with a central mast, it was sold to a white man.

The Whaling Canoe Project as Material Culture Study

Material culture is not a popular subject in the anthropological sub-discipline of ethnology and attention to it brings not only indifference, but also often condecension from colleagues with attendant disasterous peer rating. To study material culture is to be out of it quite entirely, to be dim-witted, fit perhaps for a museum. And, as strange as it may seem to outsiders, even in museums ethnologists have a hard time trying to make themselves study their artifacts because of their seeming lack of academic relevance, many simply avoiding them entirely or paying only sporadic secondary attention perhaps for display programme reasons. There are those, too, who are so caught up by administration, public relations and service, and other institutional concerns that they scarcely study seriously and thus would seem to be beyond academic concern, yet in their organizational attention to artifact collections by way of storage, conservation and cataloguing, they sometimes come to write about material culture. Such is the situation in North America at least. But such was not always the case, for here, as in Europe, there was once a time when material culture as artifacts and techniques was quite central to anthropological interest, providing the comparative data on which evolutionary and culture historical theories and interpretations rested in large part. While this is not the place to pursue the topic in detail, it may be suggested that a century to half a century ago material culture furnished much of the most specific and "solid" cultural data available at the time for the kind of

interests that anthropologists held, whereas since then interests have shifted to social and ideational spheres in ways to which it is difficult to relate artifacts and techniques while the collection of data on the latter has not advanced much in sophistication and, indeed, has decreased in all probability.

For material culture to regain relevance for anthropology today, specifically for ethnology since subdivisions have grown more specialized and distinct, it would first seem necessary to better the quality of the basic data. Where a century ago the artifact in itself was sufficient in large part for use in ethnological analysis which could make interpretations from form alone, now more detailed, culturally and socially contextual information from the construction and use to the meaning and significance of artifacts is desirable since analysis has become more systemic. A major reason why it is difficult to study material culture today is that detailed documentary writings of an ethnographic sort on the subject exist rather sporadically in the literature while catalogue information in museums is often spotty in the extreme, even on the most basic facts of provenience.

The whaling canoe reconstructed recently at Port Renfrew is, for all purposes, a museum specimen even if it reposes not in some hallowed gallery or dusty ethnological collection but on public display in an historic park. Although it is not a "real" artifact that was produced and used by and in the culture and society of origin, it is one of the few examples of the larger West Coast canoes available for study so that detailed documentation should be presented to increase its academic usefulness. Since it was a reconstruction sponsored by the National Historic Parks and Sites Branch, participant observation was possible, at times, necessary, furnishing the data on construction which form the central part of the present article. Also since it was a reconstruction, the

canoe was not perfect or authentic in all details such as the relatively poor fit, in terms of traditional West Coast canoe making skill, between hull parts, the unrefined lashing of the crosspieces, the insufficiently flared sides and not sharp enough ends, and the heads that fall just short of the required elegance of proportions. It should be noted that Charles Jones, although he grew up when traditional canoes remained central to West Coast life and was imbued with interest in them, had never before translated his mental blueprint of the heads, as it were, into concrete existence, for the canoes he had built were of the modern headless variety which came into popularity with the advent of the outboard motor. He had started building late, when about 30 and his technological interest had bent to modernism to the degree that his real ambition had been to become an engineer, steam in his day. If his whaling canoe had a few shortcomings as a result of his lack of experience in construction of the traditional form, he knew of refinements in his mind from tradition, his father and mother's brother both being masters of the craft, and there is all the more reason to add the information to the present documentation as a corrective. The information is important in itself, of course, as being part of an advanced traditional body of technological knowledge on woodworking held by the West Coast people.

Outside of the academic framework as well, however, it might be asked why material culture should be studied, specifically the West Coast whaling canoe. In a way, the detailed discussion of construction has but a limited interest, and a fear is, indeed, that it must be rather incomprehensible and boring except to the few who have a strong interest and, even better, some experience in carving cedar canoes. One can only answer that the subject has qualities of the exotic and romantic, the mysterious and secret. For civilized men, so-called "primitive" technology has its interest in that it is recognized as akin to their ancient technological

history, now forgotten, and exposition of the working of wood and other natural materials with old tools such as fire, wedges, chisels, axes and adzes can draw attention even when the latter are translated into metal-edged versions. Craft techniques of different cultures have by no means been exhaustively recorded as yet, worthy as they are of documentation. It is difficult to describe what are essentially physical actions in words alone, the best mode of communication being actual demonstration followed by the learner's attempt to duplicate the process under the master's watchful eye. In the present article an abundance of photographs has been included to assist the verbal description; imagine the account without them. Also taken by way of documentation was close to 3,000 ft. of 16 mm. colour movie footage which can give further comprehension of the canoe building process of the Port Renfrew reconstruction for the strongly interested. The weak part of the documentation is recognized to be that on canoe usage and sociocultural significance since the age of traditional canoes is long past and there was not even a trial of the reconstruction in the water for the bit of observation of performance characteristics which that may have supplied. For this part of the account, reliance was placed of necessity on informant recall where accuracy is an ever present problem and previous writings, some fortunately excellent, for example Curtis (1916), Drucker (1951), Swan (1870) and Waterman (1920). These, and other sources more restricted to construction, for example, Boas (1909), Koppert (1930) and Olson (1936), are best consulted at first hand. Durham (1909) provides a knowledgeable comparative overview of Northwest Coast canoes, although further comparative analysis may certainly be attempted. A by-product of the study of the construction process of a complex artifact such as a canoe is more detailed appreciation of formal features which in turn assists greatly in comparative study, increasing the number of similarities

and differences noted and also the awareness of their relative importance and kind of significance. The difficulty is that with culture loss, it is often no longer possible to study construction in detail at first hand through some kind of re-enactment or even through informant knowledge for many things in many places as in the case of Northwest Coast canoes. It follows that in material culture, as in other realms, there is a certain need for urgent ethnography or ethnology, to use a current phrase for a condition long recognized in anthropology and generally. It is, of course, one of the main justifications for the present study.

But, it may be asked again, why study the West Coast whaling canoe in particular and there one could simply answer because of intrinsic interest. Boats evoke a more than usual interest in many men and women and on the marine-oriented Northwest Coast where a well-developed woodworking technology produced finely made artifacts whose aesthetic qualities have commanded much admiration, the cedar canoe was an artifact of primary economic importance and cultural attention. Canoes and canoe making were one of the foci of life, becoming even a major preoccupation with some Northwest Coast craftsmen. As is the case with certain artifacts, canoes could comprise much of the meaning of life for such men and, in a sense, be a major part of what they were. Such involvement could be particularly manifest where marine orientation was intense as among the island-dwelling Haida and the West Coast people whose renown as the best canoe builders in the culture area seems only logical. Not to slight the others, "The Nootka stand out as the most intrepid sea hunters of the north Pacific coast," writes Heizer in a recent popular article on the area (1974: 211). His judgment is in good degree influenced by the fact that only the West Coast people, or "Nootka," and a few neighbouring tribes to the south who were influenced

strongly by them, whaled. And the people themselves were consciously involved in whaling beyond its degree of economic significance (Drucker 1951: 49-50). Little wonder then that they admired the whaling canoe most of all among the different classes. Among ourselves as well the glamourous romance of whaling, its ultimateness of pitting human physical strength against the greatest animal, makes us feature again and again the West Coast natives as whalers in our depictions of them. And when the depiction takes the form of a museum type display, there has to be the whaling canoe, as in the case of the present project.

Canoe Terms

The following list of names for parts of canoes, whaling equipment and whales is by no means exhaustive, both informant memories and elicitation technique having shortcomings, nor is the transcription faultless, but it is included in case of possible usefulness academically or popularly, perhaps particularly for the native culture. Rendering is by the tentative anglicized spelling system outlined at the outset. "S" indicates Southern West Coast dialect, specifically Pachena (Charles Jones) and Clo-oose (Ida Jones, who supplied the majority of the S terms), while "C" stands for Central, specifically Ahousat (George Louie). It would not be difficult, of course, to compare these terms with those given for the Makah by Waterman (1920) or the Central and Northern ones in Drucker's account (1951), but these have not been listed alongside for the sake of brevity.

bow - hit'qwad (S), hithyen (C - hithiya:tsqanish, "he's at the bow")
stern - tl'icha: (S, C - tl'itl'icha:thl, "steer in the stern"; tl'icha:yish, "he's at the stern"), hiy'aqtlexs (C)
bottom - hitaqtqi: - (S), iɬqi: (C)
cutwater-skeg blade - sipo:s (S, C)
end section of hull - hi:edapoɬ (S), "where it comes to a point"
side - chabsabise (S), "the whole canoe", ina:x (C)
flare - qaq'apssa:ɬ (C)
top lip-out - qwoHwatsoɬ (C)

gunwale - hiɬixs (S)
rub strip - tl'i:hats (S)
top lean-out on inside - hu:hwaX (S)
inside - hitqes (S)
vertical-sided - ta:qiya:q (C)
flat-bottomed - ɬo'pi: (C - ɬo'oq, "board")
round-bottomed - ho:sm'atqomoɬ (C), "kelp-like" (ho:sm'an, "kelp")
canoe making - 'a:sok (C), "being in the woods"
crosspiece - tap'a:b (S), ta:pam (C)
seat - kwa:sats (S - kwa:s, "sits")
canoe mat - ch'iba:t (S)
floor boards - tl'i:tsi:b (S), ɬo:ksom (C)
end floor boards - tl'i:tsi:dab (S), ɬo:tsiyenam (C)
canoe covering - tl'i:tsi:'idab (S)
head piece - qwab (S), qwam'a (C - qwa'aɬa'apshish, "he's putting the head on")
bow head - qwaqa:ob (S)
bow tip projection - laqw'iɬtab (S - laqw'e:ik, "tongue")
lump on "throat" section - ti:ti:chawi: (S), "heart"
grooves along top inside - tsuts'i: (S - tsutsshitl, "he scratches")
scarf joint - tabedokw (S)
scarf hook - qa:heidekop (S), "holds together"
head fitting straps - tap'chaqsebɬ (S)
pegs for joint - tla:p'qab (S)
cedar withe for lashing - tla:sapt (S)
patch - tl'asi: (S), tl'itsa: (S), ats'inam (C), na:tma (C)
patch on top of side - at'sa:qseb (C)
plug - chi:piu (S - chipshitl, "he plugs")
knothole - kluch'aX (S)
charcoal - bihits'a:bs (S), tomi:s (C)
oil - tl'aqabs (S)
red ochre - tl'eXsuk (S)

bright red colouring from Washington - Heisit (S)
blue-grey clay - si:'iyaX' (S)
black muck - X'ai:tsk (S)
bottom charring - ei!qa: (C)
paddle - tl'ata:'awajk (S), uxw'api (C)
oar - dittl'i:'ig (S - dittl'i:ditl, "to row," from ditlqachtl, "to lean back")
sail, of any kind - tl'i:tsape'e:q (S - tl'i:tsap, "to sail with the wind")
lug sail - q'aq'atsi'i:ɬ (S), "pole in the corner"
top yard - tl'oshXi:b (S)
halyard - ch'a:pitlɬe:k (S)
sheet - tsisto:p so:yaX (S), "line that you hold on to"
bottom yard - tl'ostsi:yaXleb (S)
boom jaw, to fit mast - tl'apa:'abichib (S)
to reef - qats'ab (S)
reefed - qa:tawat (S), "half a sail"
mast - tl'aXseb (S)
mast step - hula!aXseb
bailer - ho:ch'aq (S - ho:tlHoi, "bailing), Ha!yem (C)
water box - ch'aXseb (S)
harpoon shaft - dopi:yaX (S)
scarf wrapping of cherry bark - di:diqwa:dib (S)
harpoon head - qwi:qa:bɬ (S)
mussel-shell blade - tl'otsXqwi: tl'och'a:b (S)
lanyard - tl'oqwedbt (S)
whale sinew - tsisto:boXted (S)
sinew line - tsisto:p (S)
sea lion gut line - ts'i:yep (S)
float - tokwaqabɬ (S)
California gray whale - chitapqw (S)
sperm whale - kutsqi: (S - kotsop, "the little mussels on the head")
right whale - i:chip (S), "old"

humpback whale - sixHaox (S)
blue whale - yach'o:bad (S)
killer whale - qaqawad (S - qa:wad, "long," about fin)
eye - qali'i (S - which is fat and good to eat)
tongue - laxqu'i:q (S)
jaw bone - ts'iowa:p (S)
blow hole - heHhoɬ (S - heHshitl, "it blows")
saddle - shich'a:q (S)
fore flippers - lulapi: (S)
flukes - aboXtsi: (S)
creases underneath - tsa:baqaq (S)
whale skin - tl'i:do:ts (S)
blubber - tl'a:X (S)
blubber knife - aqe:q (S)
blubber cutting - tl'a:qo:yeq (S)
handhold cut in blubber - qoXsiwi: hitqsawi: (S)
line to pull off strip - tsisto:p so:yaq o:yoX (S)

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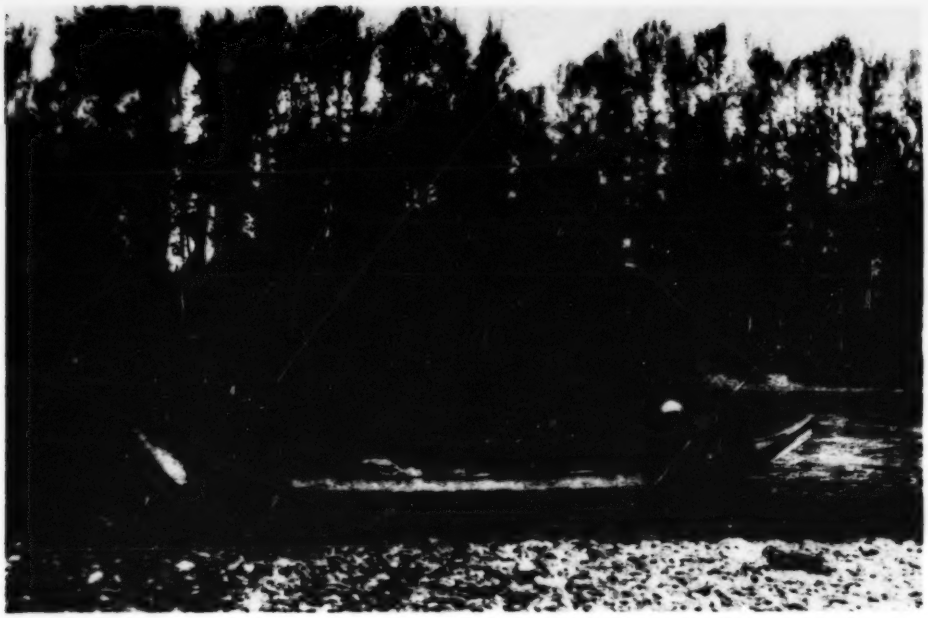
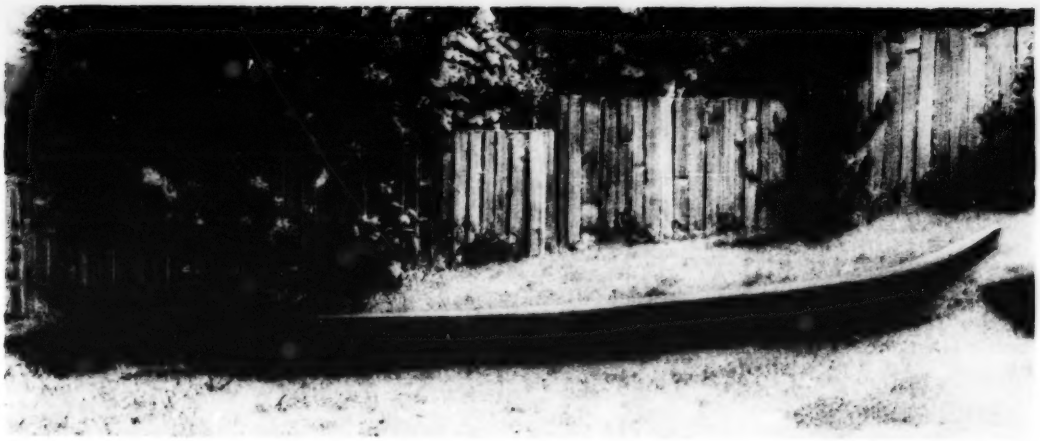
ILLUSTRATIONS



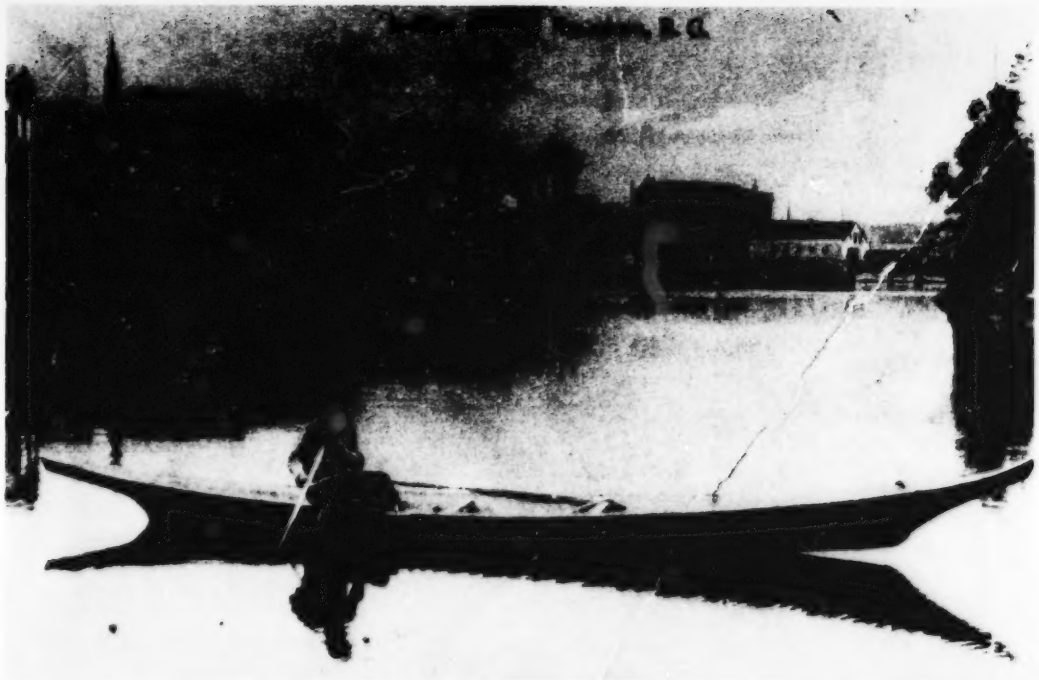
1 Northern style canoe, Tsimshian, being poled by "Gideon and wife on the Nass." (British Columbia Provincial Museum.)

2 Northern canoe beached, Kwakiutl with painted Sisiutl design, used by E.S. Curtis. (British Columbia Provincial Museum.)



3 Coast Salish yishelt of Vancouver Island, collected at Saanich, 1973, by Peter Macnair. (British Columbia Provincial Museum.)

4 Coast Salish nokwil of mainland on Harrison Lake. (British Columbia Provincial Museum.)

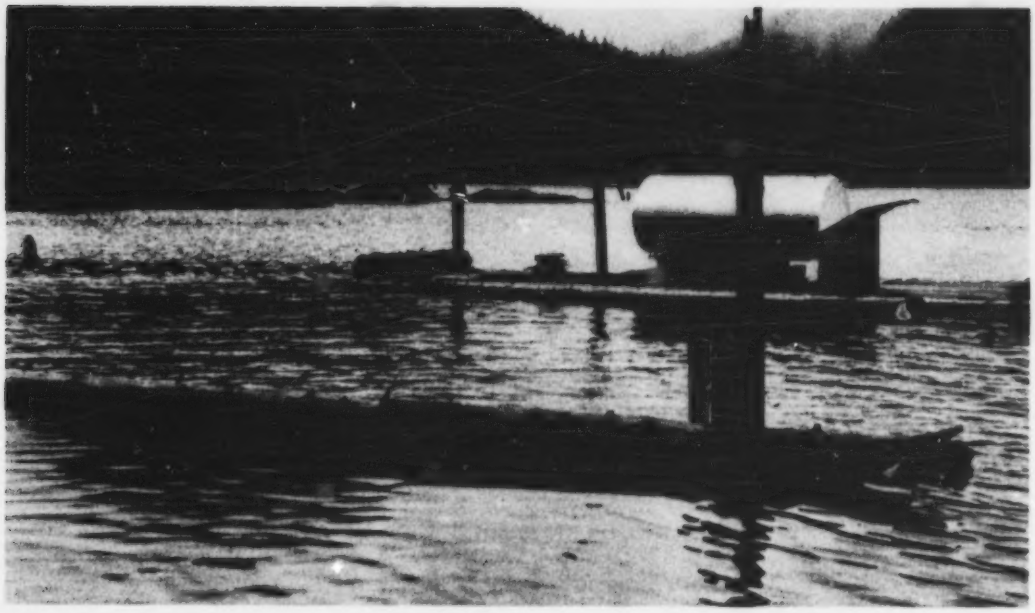


5 Coast Salish style variant with identical ends at Nanaimo. (British Columbia Provincial Museum.)

6 West Coast style freighter at Victoria in 1890s, now in the British Columbia Provincial Museum collection, length 41 ft. (British Columbia Provincial Museum.)

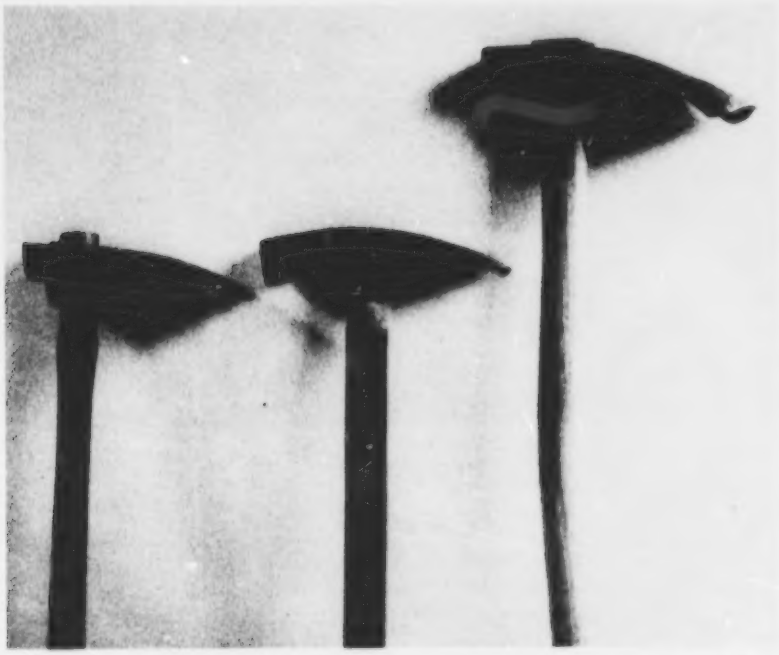
7 "Shovel-nose" river canoe beached at Yale on the Fraser, 1912. (British Columbia Provincial Museum.)

8 Sharp-ended river dugout on the Fraser, photographed 1950-51 by Wilson Duff. (British Columbia Provincial Museum.)



9 "Spoon" type Wannock river canoe at Rivers Inlet, photographed 1955 by Wilson Duff. (British Columbia Provincial Museum.)

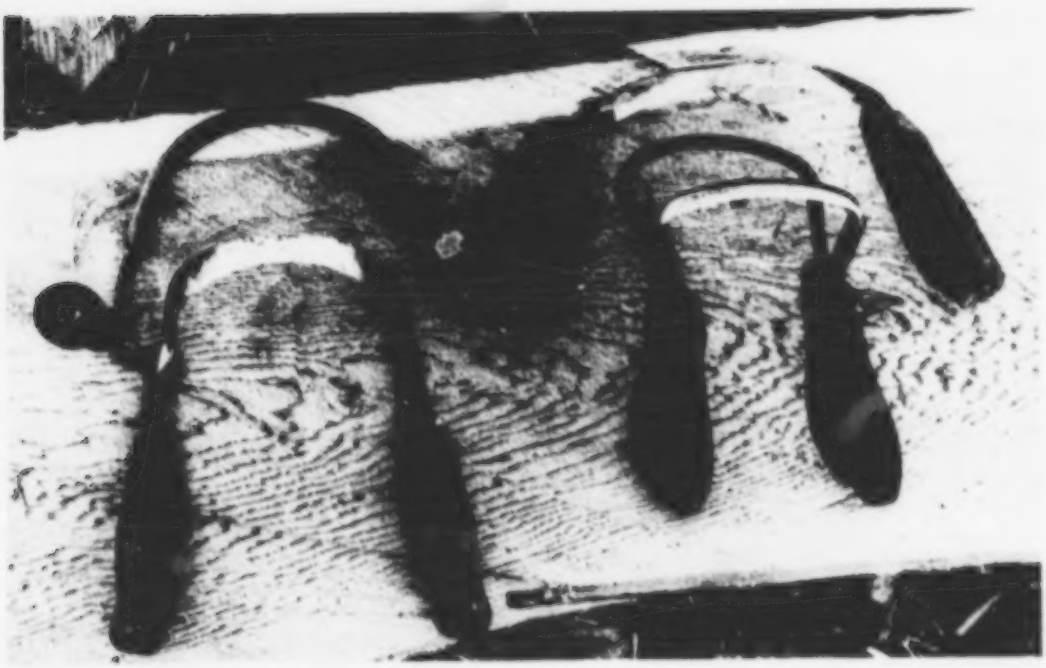
10 Large adzes owned by Charles Jones, Sr., showing varying degrees of blade-edge curvature.



11 Profile views of flat-edged large adze heads showing longitudinal curvature.

12 Profiles of two scoop-edged large adze heads.

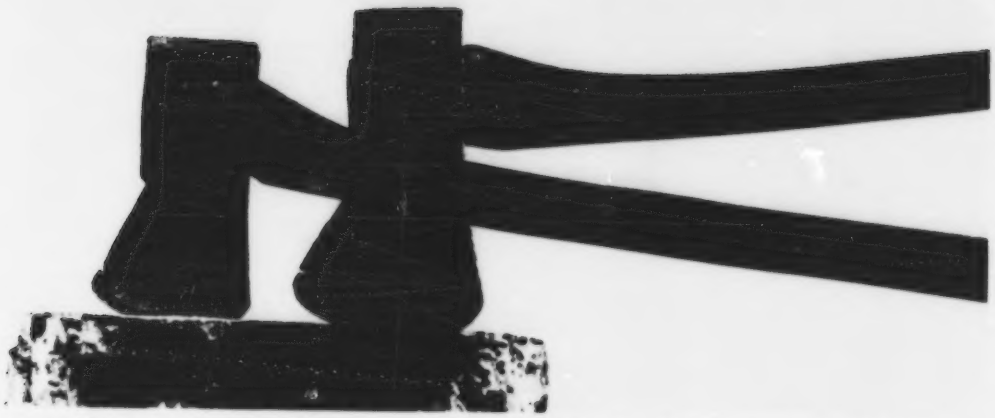
13 Charles Jones's three D-adzes for canoe building.



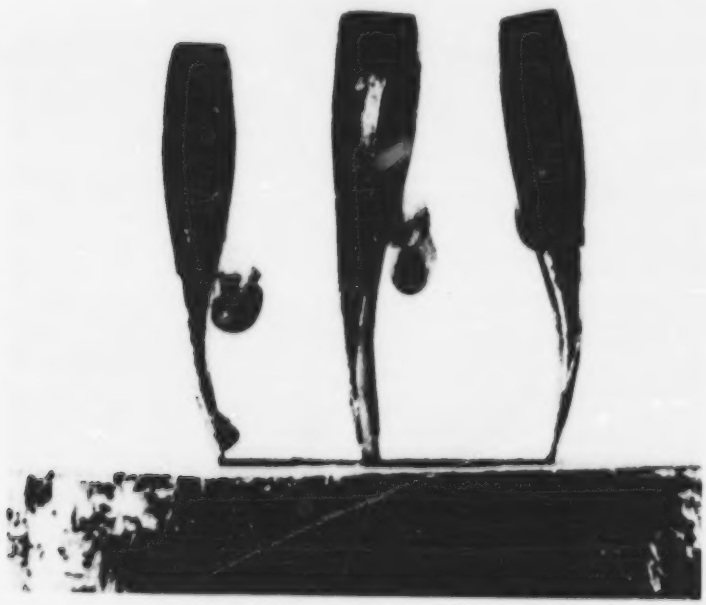
14 Curved drawknives.

15 Swivel-mounted spokeshave and plane.

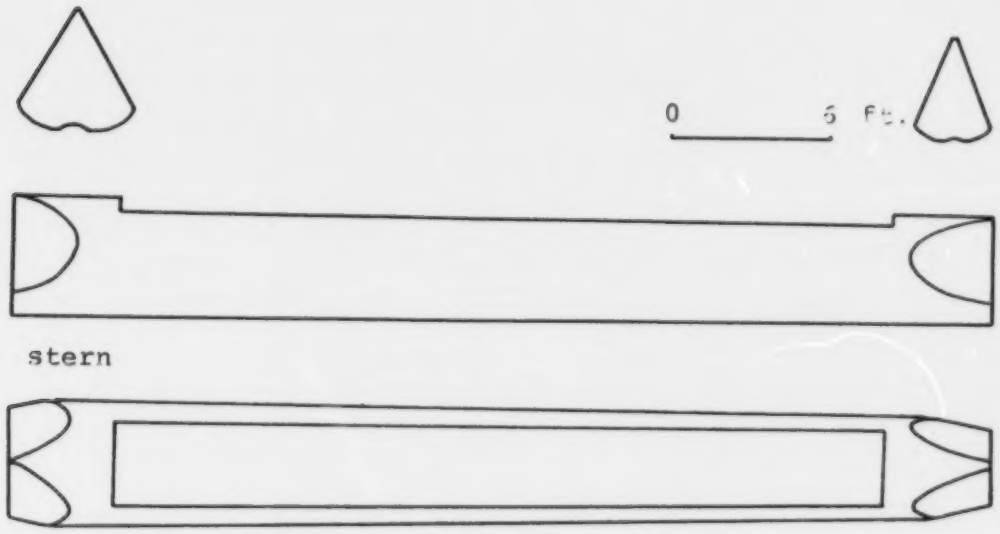
16 Axe with curved handle (right) for hull hollowing.



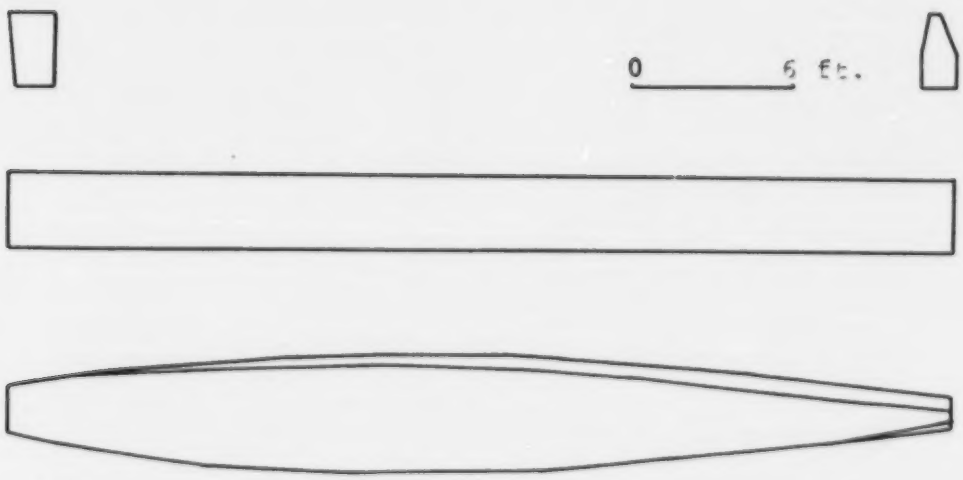
17 Profiles of single-blade axe heads hafted reversed for hollowing the narrow ends of the hull.



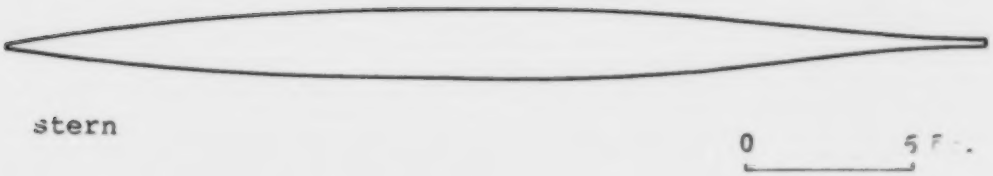
18 End-on views of axes with blades bent over to side for hull hollowing. Note lipped tip on axe to left.



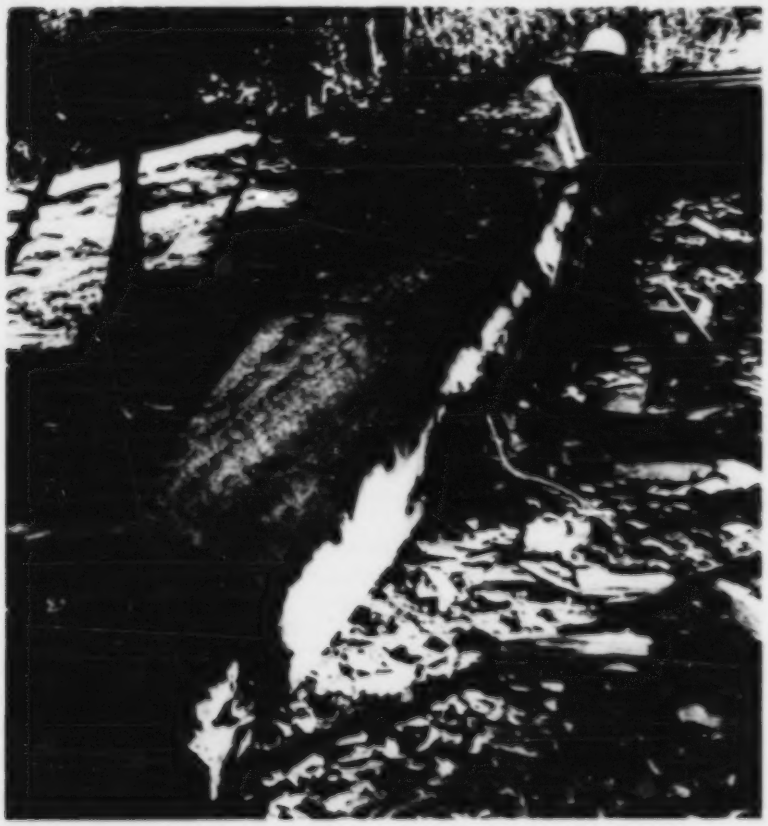
19 Blocked-out canoe log of 1967, bottom up, length 37 ft.



20 Blocked-out canoe log of 1968, bottom up, length 35 ft. 1 in.

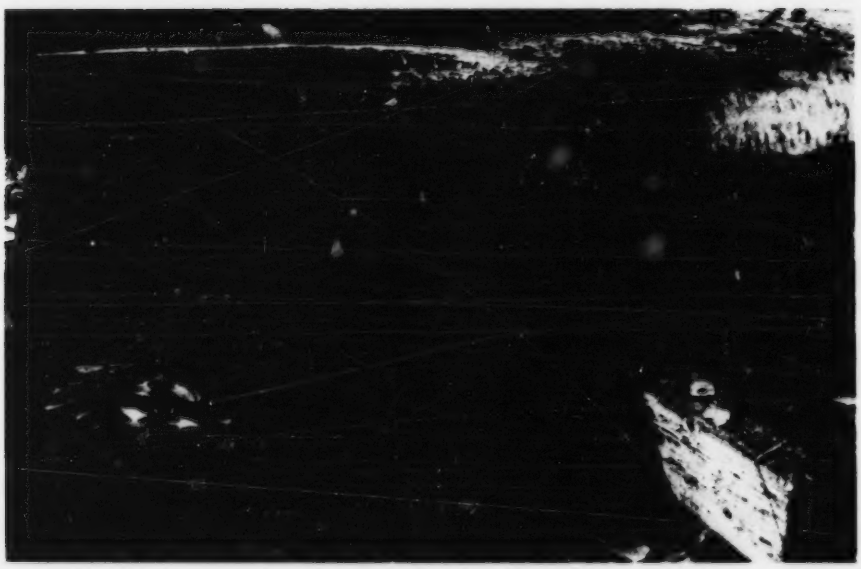


21 Bottom outline marked, 22 November 1973.

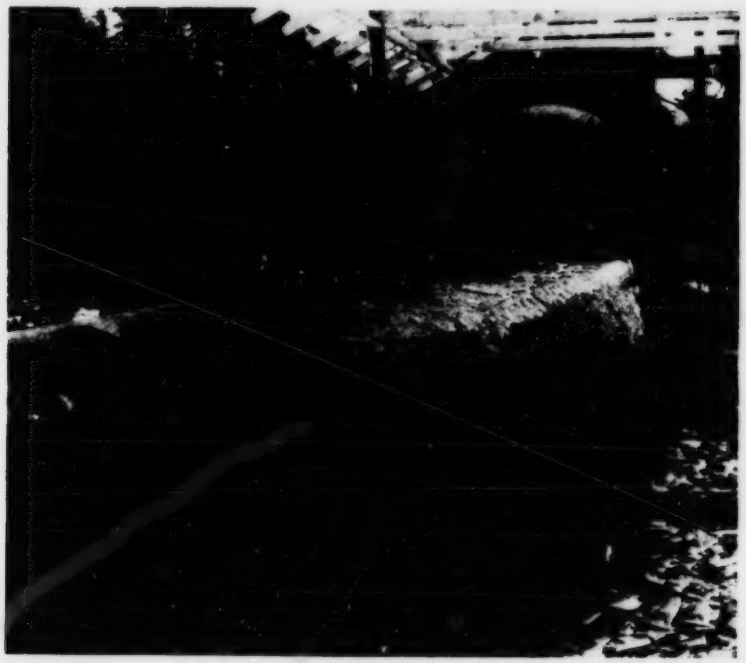


22 George Louie, Sr., taking down the bottom surface to bring out the end cutwater-skeg blades, top three-quarters view from bow.

23 Top three-quarters view from stern of bottom work.

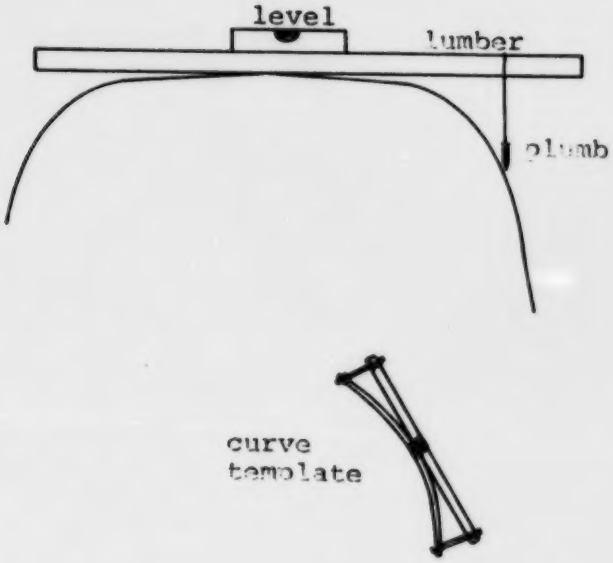


24 Stern section showing elevation of sipo:s above the main bottom surface. Note centre rot emerging on port as the end was narrowed.

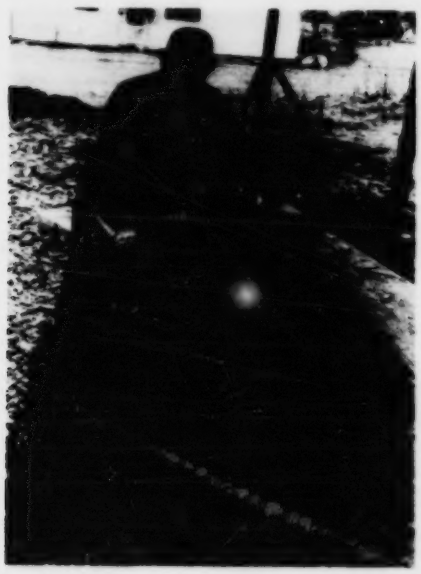


25 George Louie rounding off the bottom edge, view from bow.

26 George Louie planing bottom, bow view.



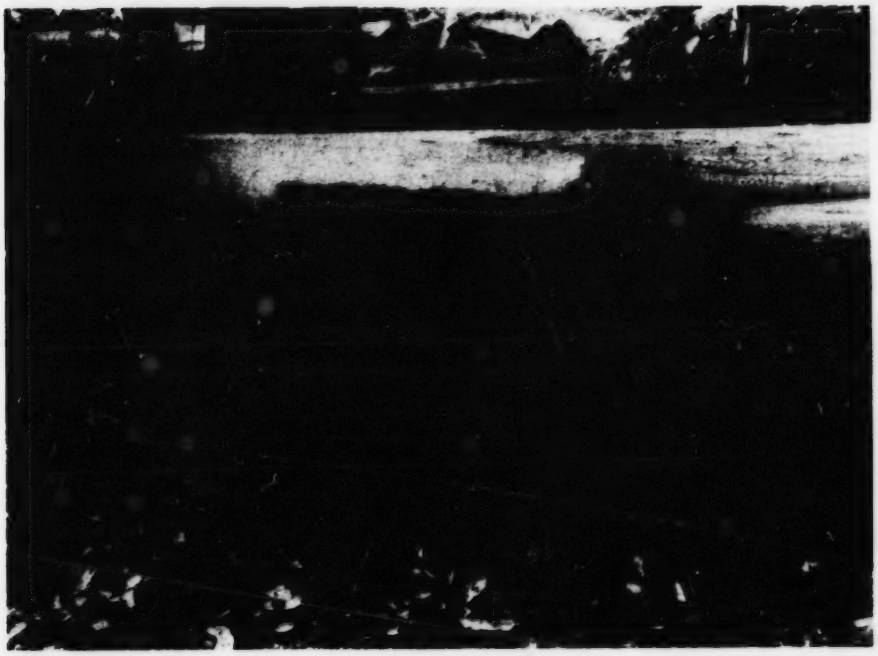
27 Diagrams of longitudinal line marking setup (above) and bent stick template (below).



28 Charles Jones demonstrating use of board template for equalizing transverse curvature at turn of bilge.

29 Adzing off the high spots marked by the template.

30 John Livingston levelling intervening surface with an elbow adze, bow three-quarters view.



31 Stern section showing reduced elevation of sipo:s.

32 Canoe log rolled right side up with removal of top excess begun amidships. Note bow centre rot.

33 George Louie wedging to rough hollow the hull.

34 George Louie chopping inside.

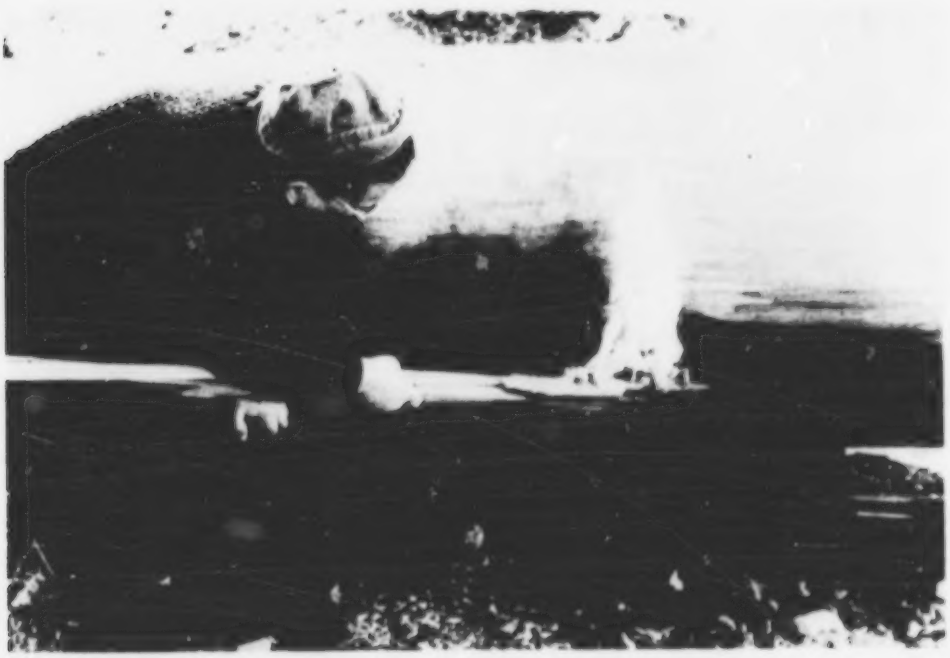
35 George Louie hollowing the bow with a large cupped adze.

36 Smoothing the top sheer with a drawknife.

37 Stern port after patching and chain sawing.

38 Adzing the long patch for the port bow crack.

39 Bow port after addition of crack patch and block to replace centre rot.



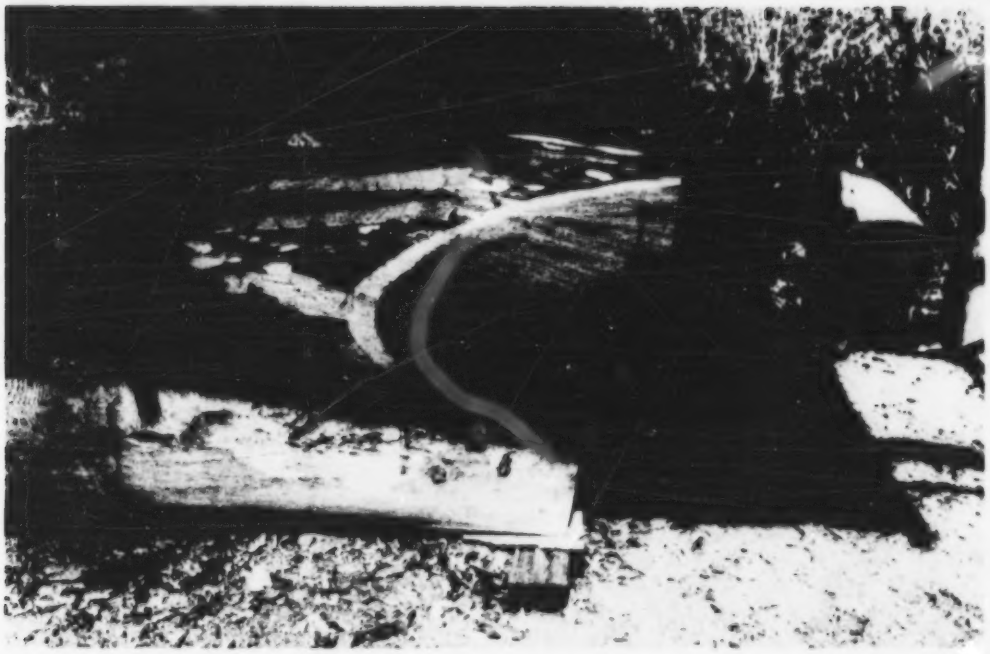
40 Burning the hull surface.

41 Dressing the interior with the cooper's adze.

42 Smoothing the inside with a shallowly curved drawknife.

43 Shaping and smoothing the turn of the bilge inside with the deeply curved drawknife serving as a pattern.

44 Thickness-gauging holes indicated by plugs in a Kwakiutl hull, Quatsino. (British Columbia Provincial Museum.)

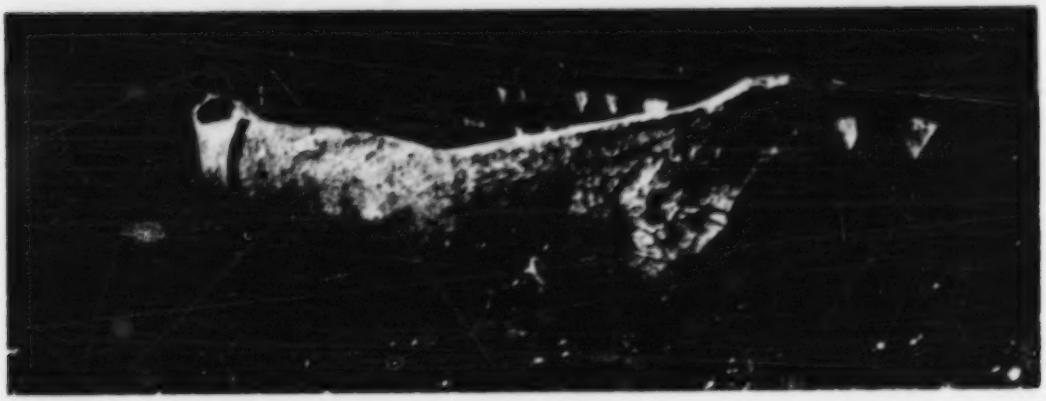


45 Stern head piece blocked out and being fitted on the hull.

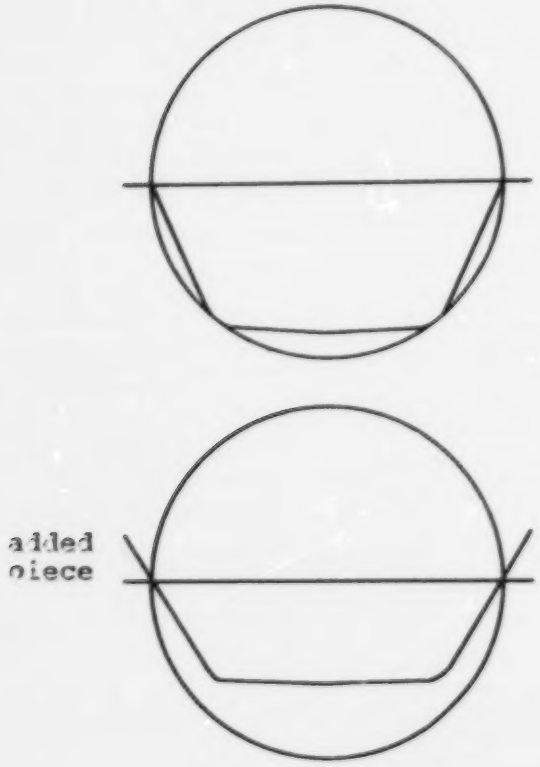
46 Adzing off the high spots marked with charcoal on the head scarf surface.

47 Smoothing the head scarf surface with the spokeshave.

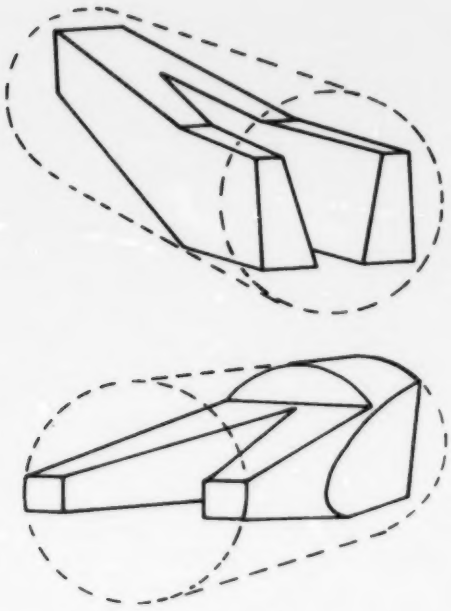
48 Charles Jones adzing the flare-out at the top of the stern head piece.



49 Northern style Tsimshian canoe under construction at Kispiox showing crowned sides to allow for their depression by the spreading. (British Columbia Provincial Museum.)



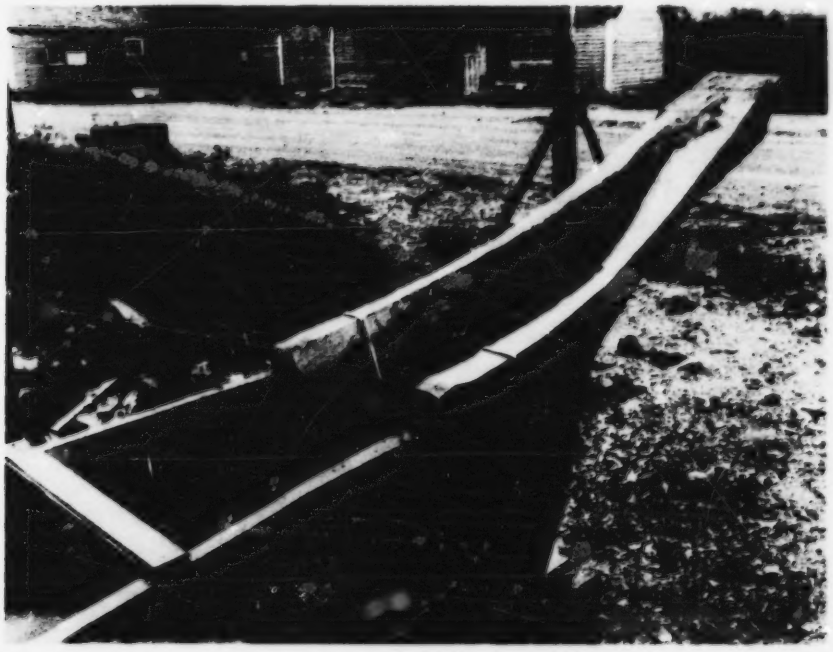
50 Diagrams comparing log use with and without planked-up sides to the hull.



51 Diagrams of blocking out the bow (above) and stern (below) head pieces.

52 George Louie adzing the sides of the bow head for concave flare.

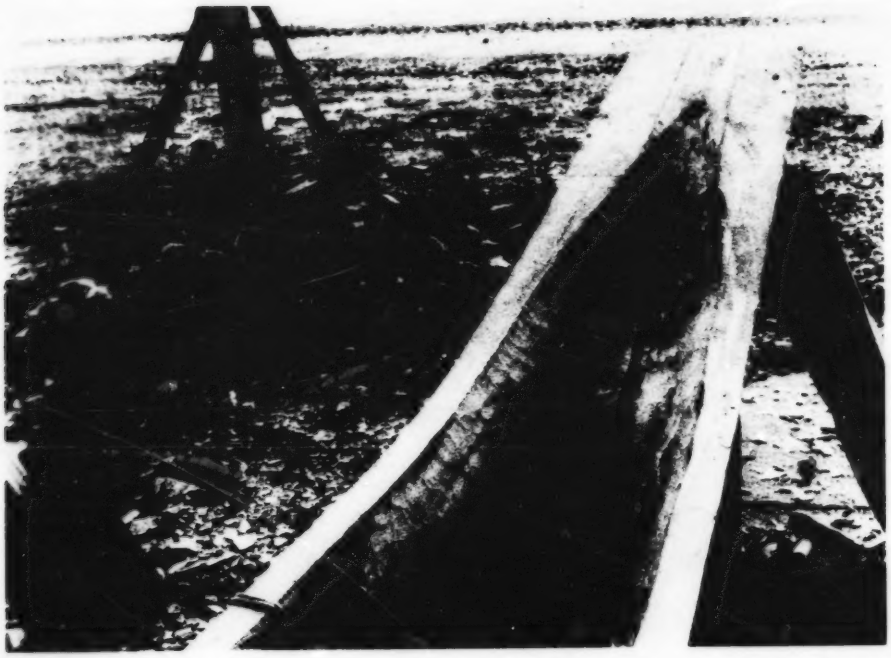
53 Bow head positioned for rough hollowing of inside.



54 Bow head tied temporarily in place by special straps for fitting and shaping integrally with the hull.

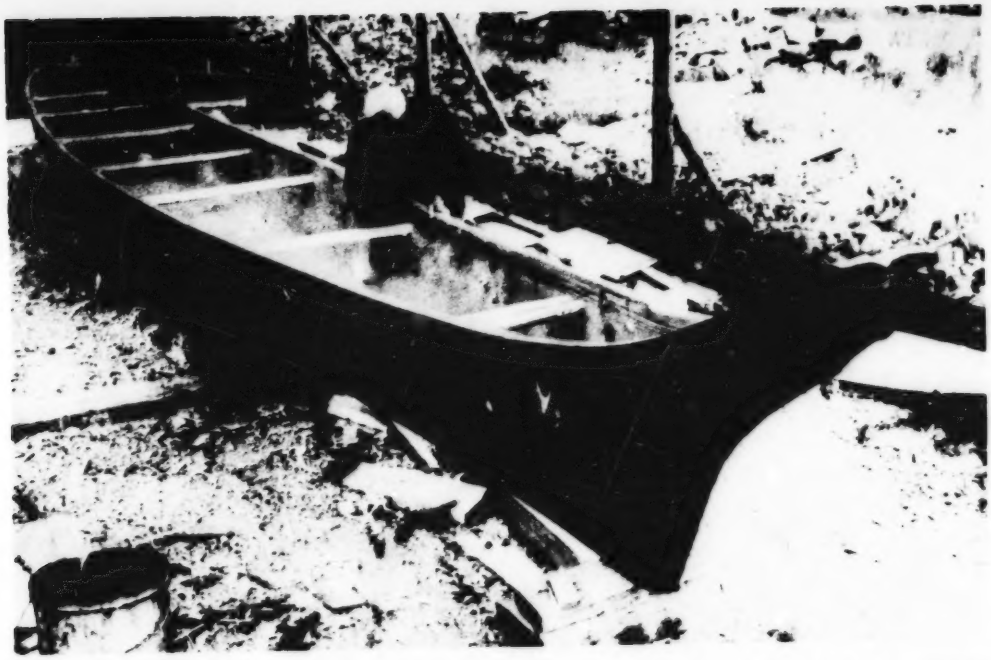
55 Marking the head scarf curvature to match that of hull with a spacer and pencil.

56 Charles Jones smoothing flared sides of tip projection with curved knife.



57 The wedge-shaped tongue at the back of the harpoon groove demarcated by chiselling.

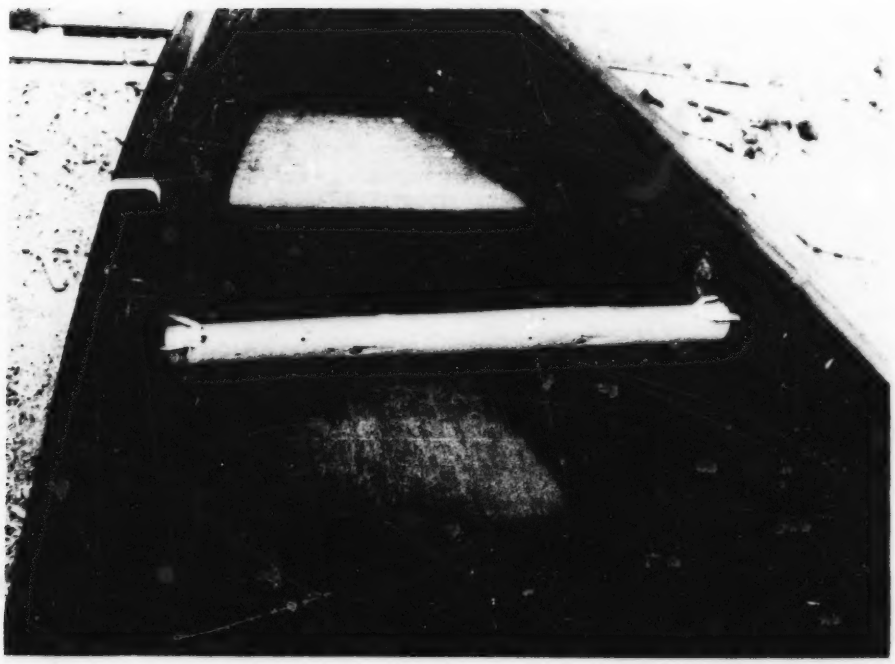
58 Problem area at port bow quarter.



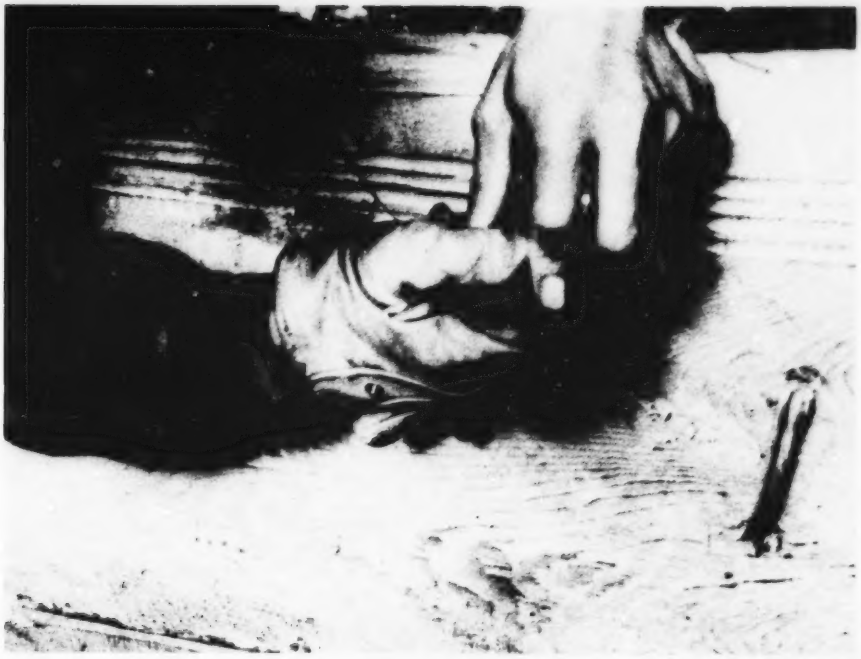
59 Charles Jones sanding inside of nearly finished canoe.

60 Ken Hallberg of British Columbia Forest Products, Port Renfrew Logging Division, inspecting Charles Jones's creation.

61 Stern detail showing pegging of steersman's seat and head elevation.



62 Stern interior with seat, duckboard and last crosspiece.



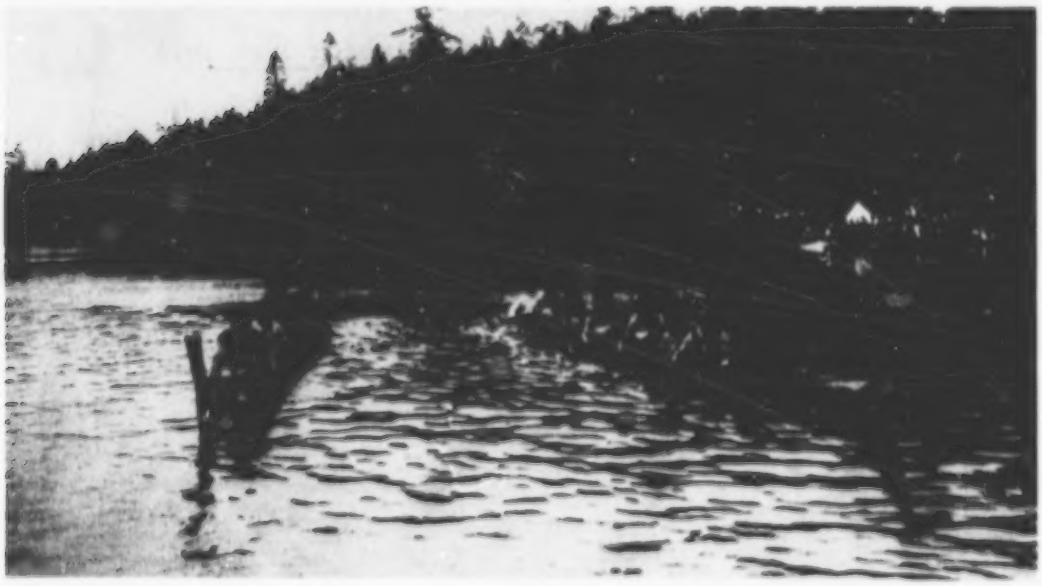
63 Gouging in the side grooving at bow head joint.

64 Large canoes beached, possibly at Victoria.
(British Columbia Provincial Museum.)

65 Two-masted canoe at Muchalat Arm, 1896. (British Columbia Provincial Museum.)

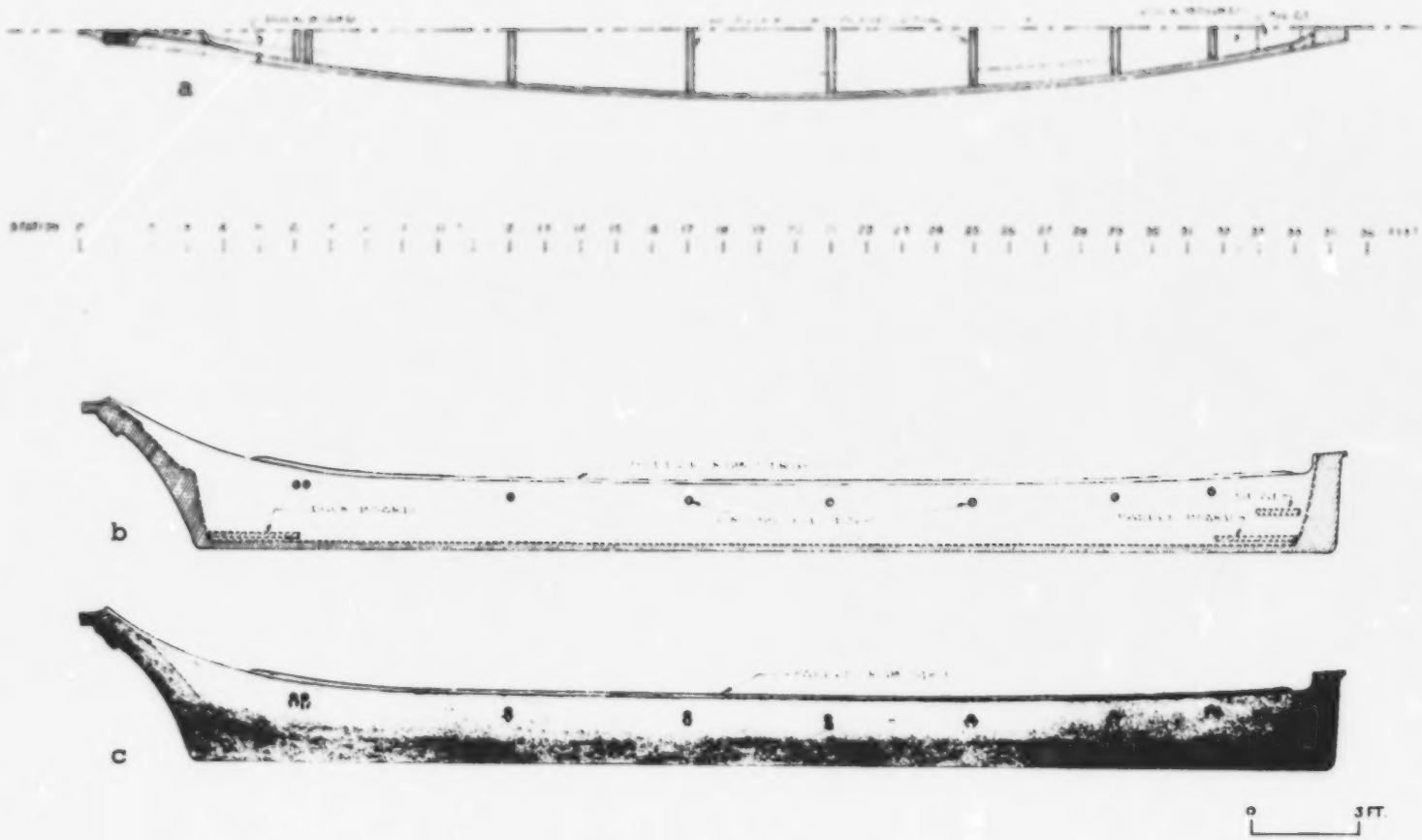
66 Big canoe near Ucluelet, 1890s. (British Columbia Provincial Museum.)

67 Striking with a second harpoon. (Bert Kellogg Collection; from a copy in the British Columbia Museum.)

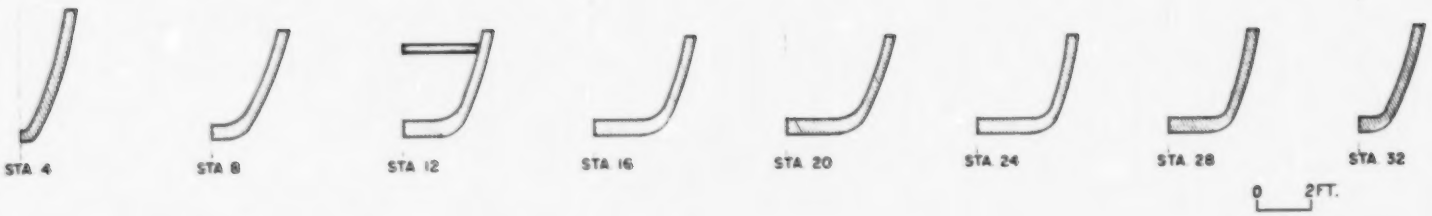


68 Racing canoes on the Gorge, Victoria, 1922. (British Columbia Provincial Museum.)

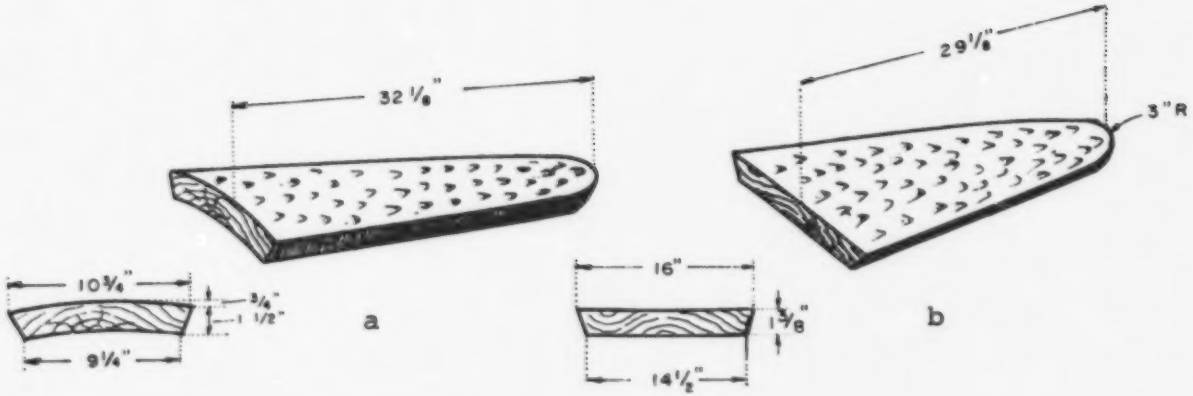
69 Giant Nitinat canoe by O:dayo, 1912.
(British Columbia Provincial Museum.)



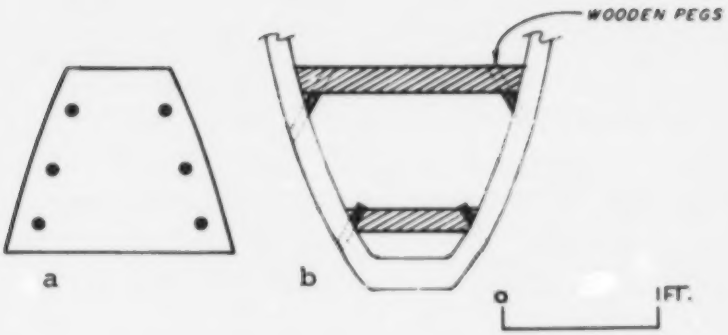
70 The reconstructed whaling canoe: a, half plan view; b, longitudinal section, and c, side view. (Drawing by R.L. Clapp.)



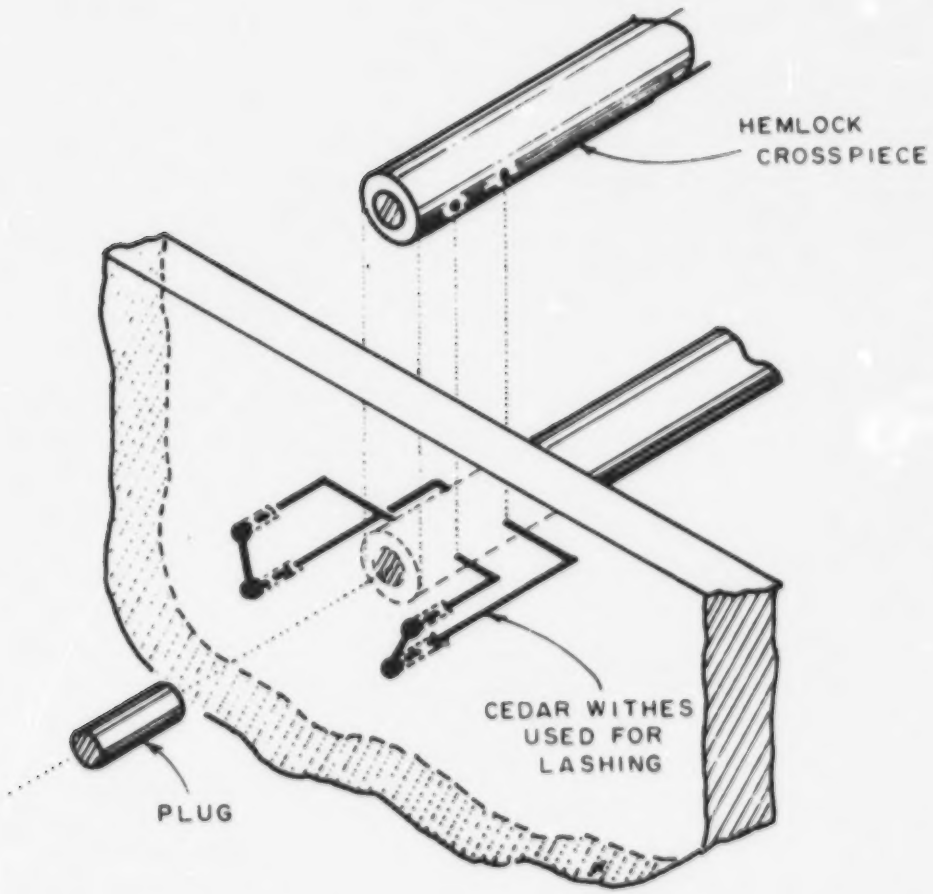
71 Half cross-section views of the hull. (Drawing by R.L. Clapp.)



72 Foot board detail: a, bow, b, stern. (Drawing by R.L. Clapp.)

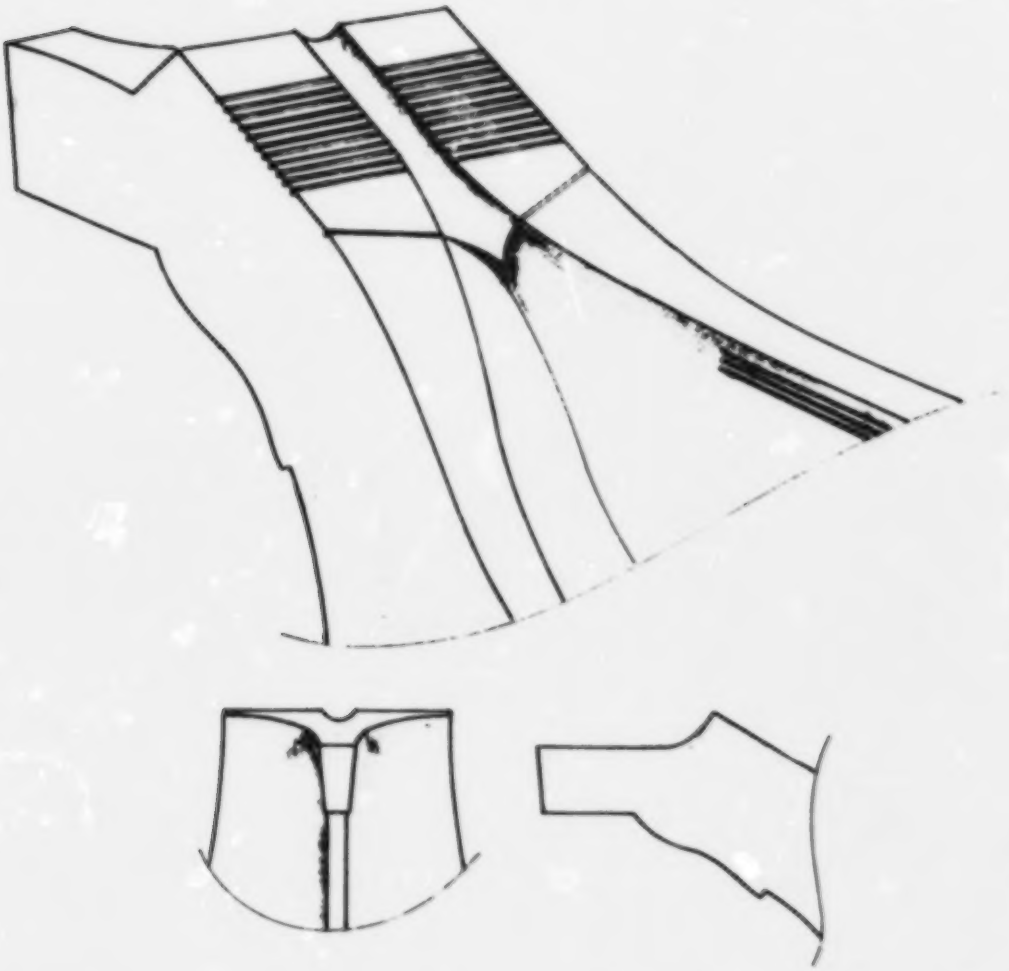


73 Seat detail: a, plan view, b, cross-section. (Drawing by R.L. Clapp.)



74 Hull section showing the method of lashing cross-pieces to the hull. (Drawing by R.L. Clapp.)

75 Paddle views. (Drawing by R.L. Clapp.)



76 Bow detail (not to scale). (Drawing by R.L. Clapp.)

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2 Histoire économique et sociale de Saint-Lin, 1805-1883, et l'importance de la famille Laurier, by Réal Bélanger. 1975. $4.00; $4.80 outside Canada.

3 Historique structural du fort George, by Yvon Desloges. 1975. $5.00; $6.00 outside Canada.

4 Plans de l'architecture domestique inventoriés aux Archives Nationales du Québec à Montréal; Plans de l'architecture commerciale et industrielle inventoriés aux Archives Nationales du Québec à Montréal; Plans de l'architecture publique, de l'architecture religieuse et du génie mécanique inventoriés aux Archives Nationales du Québec à Montréal, by André Giroux, Nicole Cloutier and Rodrigue Bédard. 1975. 3 vols. $11.00; $13.20 outside Canada.